PHASE I
REMEDIAL INVESTIGATION REPORT
CITY OF MORRISON
MORRISON, ILLINOIS

October 1987

VOLUME I

PREPARED FOR:

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

JOHN MATHES & ASSOCIATES, INC.
Post Office Box 330
210 West Sand Bank Road
Columbia, Illinois 62236

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EXECUTIVE SUMMARY

This report summarizes the results of the Phase I site remedial investigation performed for the Illinois Environmental Protection Agency (IEPA) by John Mathes and Associates, Inc., in the City of Morrison, Illinois. This investigation was prompted by the discovery of trichloroethene (TCE) in the city water supply wells at Morrison during a sampling inventory of municipal water supplies by the IEPA Division of Public Water Supplies on December 3, 1986. This report presents relevant information from the field activities performed during the investigation, identifies data gaps, and preliminarily screens potential remedial actions to address the presence of TCE in the city water supply.

PHASE I
REMEDIAL INVESTIGATION REPORT
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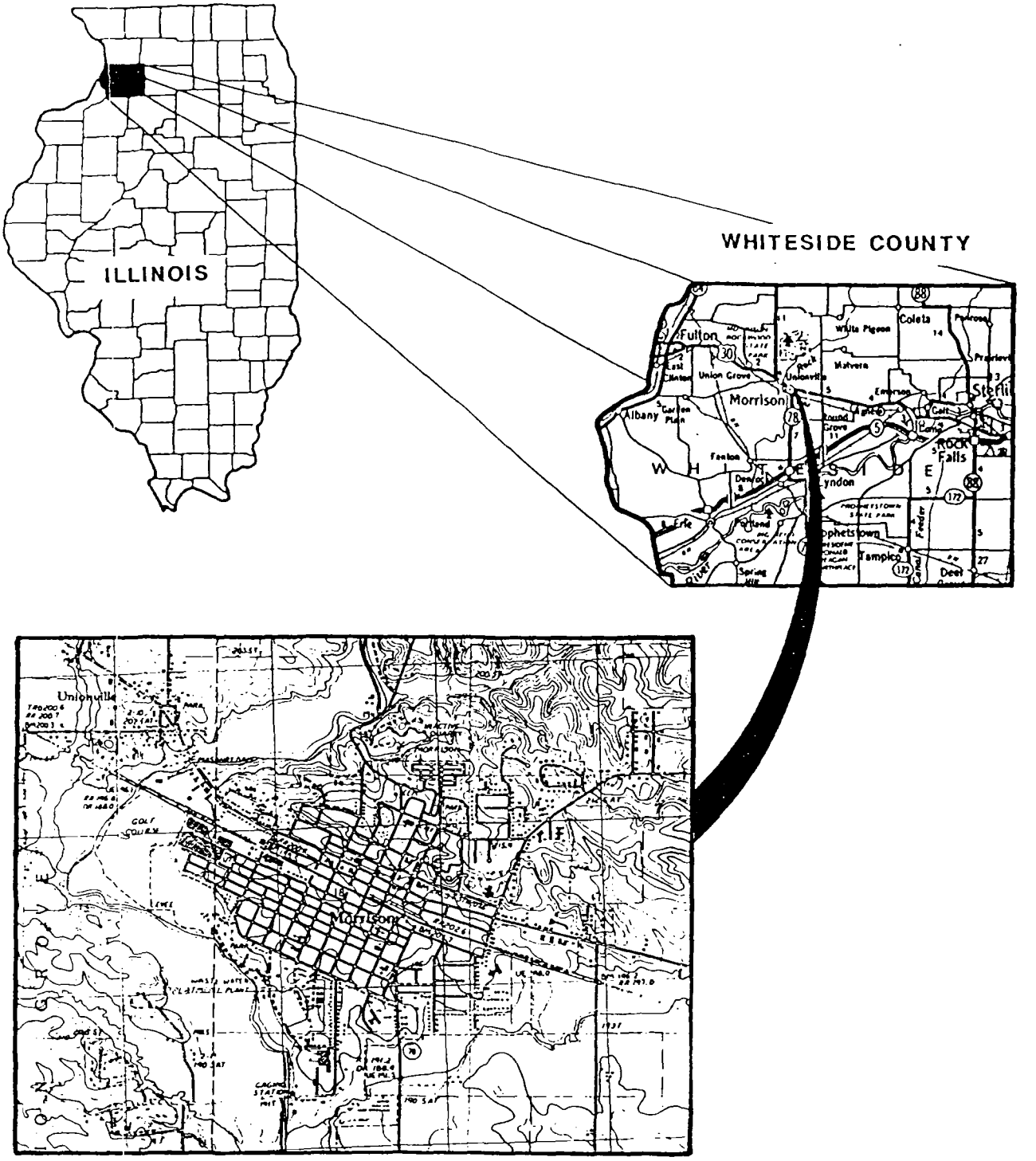
MORRISON, ILLINOIS

1 INTRODUCTION

1.1 General

This report summarizes the results of the Phase I site remedial investigation performed for the Illinois Environmental Protection Agency (IEPA) by John Mathes and Associates, Inc., (Mathes) in the City of Morrison, Illinois. The scope of the site investigation and all techniques and methodologies employed during on-site field activities are described in the Site Investigation Work Plan submitted by Mathes to the IEPA on June 3, 1987. On-site field and data collection activities were performed from May 5 to July 3, 1987.

The City of Morrison is located in the northwestern portion of Illinois near the center of Whiteside County (Figure 1-1). The site is shown on the Morrison 7.5-minute topographic quadrangle map distributed in Township 21 North, Ranges 14 and 15 East. The investigation area is bordered on the southwest, west, and northwest by Rock Creek; on the south by the Fairgrounds; on the east by Jackson Street; and on the north by the quarry and Kelly Park. Figure 1-2 is a map of the investigation area and pertinent cultural features.



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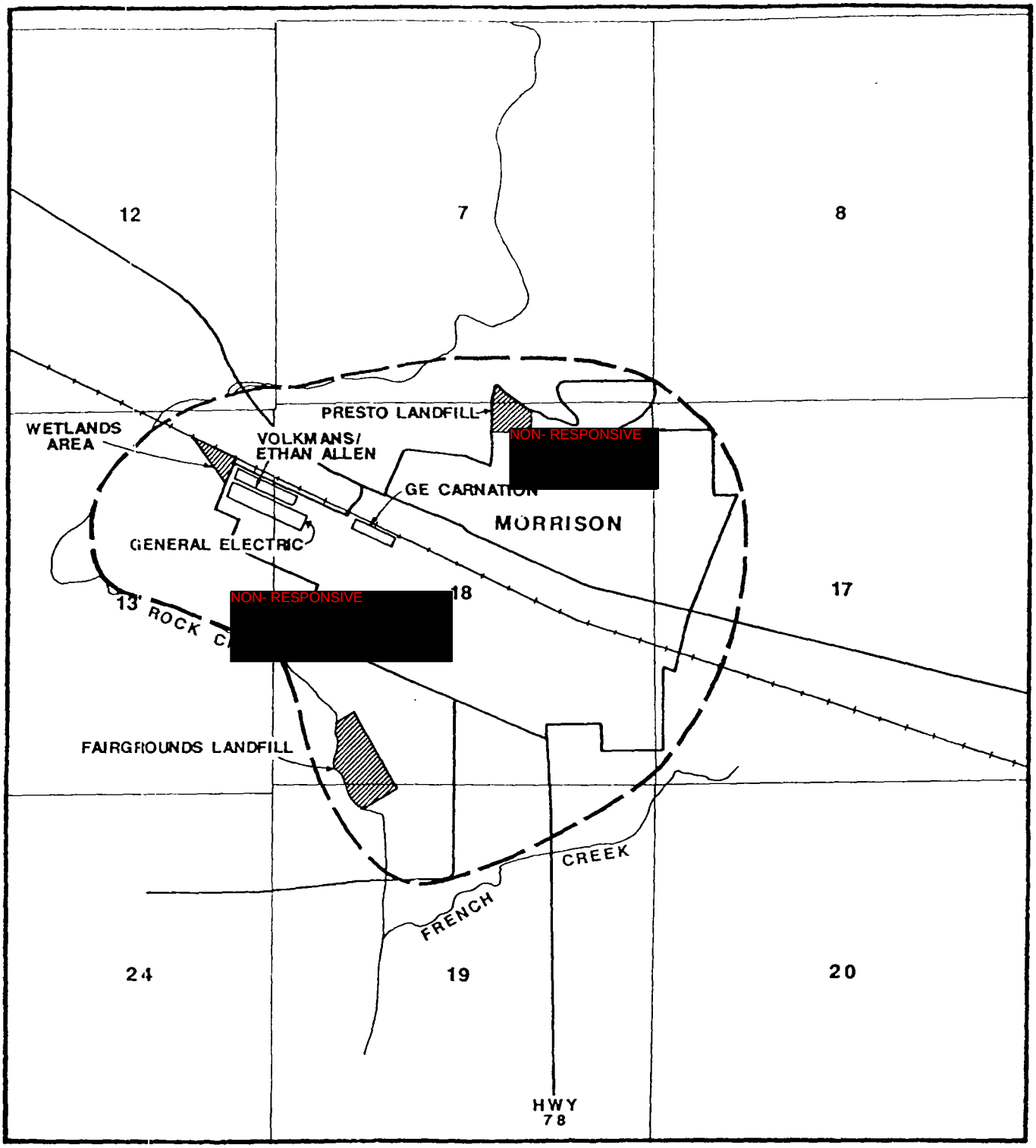
(USGS, 1985)

John Mathes & Associates, Inc.	
SITE LOCATION MAP	
12872832	FIGURE 1-1



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EXPLANATION

— — APPROXIMATE AREA OF INVESTIGATION

24 SECTION NUMBERS

John Mathes & Associates, Inc.	
APPROXIMATE AREA OF INVESTIGATION CITY OF MORRISON, ILLINOIS	
12872832	FIGURE 1-2

Pertinent features within the City of Morrison include several private residences, the General Electric plant, the General Electric Carnation (GE Carnation) plant, the Volkmans/Ethan Allen facility, and several landfills. Residences served by private water supply wells are located northwest and southwest of the city.

1.2 Background information

The municipal water supply of Morrison has been supplied with water from three pumping wells that draw groundwater from deep bedrock formations, which include the St. Peter Sandstone and the Prairie du Chien Dolomite. These pumping wells are City Well Nos. 1, 3, and 4. A fourth deep well, City Well No. 2, has not been used since December 1985.

Groundwater samples collected by the IEPA in December 1986 from City Well Nos. 1, 2, and 3 were reported to contain concentrations of trichloroethylene (TCE) in the parts per billion range. Reviews of historical records and interviews with city personnel conducted by the IEPA have identified potential TCE source areas in and around the City of Morrison.

Past disposal of industrial wastes, including TCE, has potentially occurred at five mixed waste landfills or disposal sites in the Morrison area. In addition, a 1939 aerial photograph obtained from the County Highway Department in

Morrison shows a scarred area (a potential dumping site) under what is now the northwest corner of the General Electric building across from the Volkmans/Ethan Allen property.

The five areas where mixed waste disposal may have occurred are Presto Landfill, Quarry Landfill, Fairgrounds Landfill, Whiteside County Landfill, and the Wetlands Area. Only the Presto and Fairgrounds landfills and the Wetlands Area are considered in this project. These are shown in Figure 1-2. The Whiteside County Landfill is currently in operation and is being continually monitored according to Resource Conservation and Recovery Act (RCRA) regulations and is, therefore, not considered in this project. The Quarry Landfill is being considered under a separate investigation by the IEPA and is also not considered in this project.

The following is a brief historical summary of operations at all five landfills taken from Tapson (1987).

1. The Presto Landfill is the oldest landfill in Morrison and is reported to have been closed approximately 30 to 35 years ago. It was used for disposal of mixed waste and may include industrial wastes. It is named for the Presto ballfield built on top of it.

2. The Quarry Landfill operated from approximately 1958 until 1967 and was used as a mixed waste landfill. It is located approximately 1.5 to 2.0 miles north of Morrison and is named for an inactive quarry.

3. The Fairgrounds Landfill opened when the Quarry Landfill closed and operated for approximately eight to ten years. It closed in 1974 after the Whiteside County Landfill opened. It is named for the fairgrounds (two softball fields) built on the landfill.

4. The Whiteside County Landfill is located approximately three to five miles east of Morrison. It is an active landfill and has been in operation since 1971.

5. The Wetlands Area is not truly a landfill, but may have been used for the disposal of industrial solvents that reportedly included TCE. It is named for its wet nature and its ability to support wetlands vegetation.

In review and discussion with city officials, it is possible that each of the four mixed-waste landfills may have accepted TCE and other industrial wastes for disposal. City officials also believe it to be possible that TCE may have been disposed of in the Wetlands Area, behind Ethan Allen and General Electric. Previous owners of the General Electric facility include Liquid Carbonic Corporation and Herman Nelson, a private individual, who may have used the Wetlands area as a disposal site. The Wetlands area is currently owned by Volkmans/Ethan Allen and is located adjacent to their manufacturing facility.

According to City of Morrison and IEPA sources, TCE may have been disposed of in these landfills over the years (Newman, 1987). A 103-C Form (Notification of Hazardous Waste Site) filed by General Electric with the IEPA on June 1, 1981, lists the disposal of approximately 62,700 gallons of waste solvents, which may include TCE, at the Whiteside County Landfill.

TCE contamination of the city water supply wells at Morrison was discovered during a sampling inventory of municipal water supplies by the IEPA Division of Public Water Supplies (Keller, 1987) on December 3, 1986. City Well Nos. 1, 3, and 4 were sampled and analyzed for volatile organic

compounds by Method 624. City Well No. 2 has been inoperative since December 1985 and, therefore, was not sampled in December 1986.

During the December 3, 1986, sampling event TCE was detected in City Well Nos. 1 and 3 at parts per billion concentrations. The wells were resampled on December 12, 1986; TCE was again detected in the samples. The use of City Well Nos. 1 and 3 was discontinued on December 13, 1986, pending further investigation. Because of these results, the City of Morrison contracted Layne-Western of Aurora, Illinois, to install a pump for testing City Well No. 2. The test pump was installed to obtain a groundwater sample and to check the recharge rate of the well. TCE was detected in the groundwater sample obtained from City Well No. 2 on February 3, 1987. Because contamination was detected in this sample and the well had a low recharge rate, the test pump was removed on February 5 and 6, 1987.

Subsequent to the findings of the IEPA sampling event on December 3, 1986, a meeting was held among Morrison city officials, the IEPA, and representatives of General Electric on December 12, 1986. The topic of this meeting was an underground TCE tank that had been removed from the General Electric property during the summer of 1986. Soil samples were not obtained during the tank excavation and removal operations to document that the tank had not leaked. The IEPA, therefore, initiated a subsurface investigation to collect soil samples around the tank vault.

On December 19, 1986, the Physical Measurement Unit of the IEPA drilled two boreholes through the excavated TCE tank vault. The IEPA split samples with General Electric's consultant, O. H. Materials, Inc. The IEPA analyzed the samples for volatile organic priority pollutants. O. H. Materials analyzed the samples for TCE only. Five soil samples were collected: three from Borehole No. 1 at depths ranging up to 15 feet below ground surface, and two from Borehole No. 2 at depths to 15 feet below ground surface. Borehole 1 was located at the western edge of the excavated tank area; Borehole 2 was located at the eastern edge. Water and soil samples from the pond behind Volkmans/Ethan Allen building in the Wetlands Area were also collected at this time and analyzed by O. H. Materials; the IEPA analyzed only the water sample. The results of the analyses were obtained from IEPA files and are presented in Table 1-1. Measurable concentrations of TCE were found in the soil samples analyzed by O. H. Materials, but not by IEPA. TCE concentrations measured by O. H. Materials in the soil ranged from non-detectable to 526 micrograms per kilogram (ug/kg). Water from the pond behind Volkmans/Ethan Allen was found to contain TCE at 6.0 micrograms per liter (ug/L) by IEPA, and 6.77 ug/L by O. H. Materials.

Table 1-1

TRICHLOROETHYLENE CONCENTRATIONS IN WATER AND SOIL FROM SITE OF GENERAL ELECTRIC'S TCE TANK

CITY OF MORRISON, ILLINOIS
DECEMBER 19, 1986

Sampling Location	Units	TCE Concentration IEPA**	TCE Concentration O H Materials*
Water; pond behind Volkmans	ug/L	6.0	6.77
Soil; edge of pond behind Volkmans	ug/kg	NS	526.0
Soil; B-1 at 10.0-11.6 feet	ug/kg	ND	50.7
Soil; B-1 at 11.6-13.4 feet	ug/kg	ND	ND
Soil; B-1 at 13.5-15.0 feet	ug/kg	ND	ND
Soil; B-2 at 11.0-13.5 feet	ug/kg	ND	28.2
Soil; B-2 at 13.5-15.0 feet	ug/kg	ND	98.3

* Detection limits: Soil - 25 ug/kg, water - 0.1 ug/L.
** Detection limits: Soil - 1000 ug/kg, water - 1.0 ug/L.
B-1 = Boring number in TCE tank excavation.
NS = Not sampled.
ND = Not detected.

Source: IEPA, 1987.

1.3 Remedial investigation summary

The primary objective of this Remedial Investigation is to evaluate the nature and extent of environmental contamination at the Morrison public water supply well field (City Well Nos. 1, 2, and 3). This investigation was directed at identifying the source or sources of TCE contamination detected in these water supply wells. The scope of the project included:

- performing a record search by reviewing existing data and acquiring additional information relevant to past waste disposal practices near the city wells;
- reviewing existing reports and data to identify general regional and site hydrogeologic conditions;
- performing a soil gas survey to locate potential contaminant sources;
- installing, developing, and sampling eight Mathes-installed monitoring wells to measure the extent of groundwater contamination;
- sampling, on discrete intervals, one deep monitoring well installed by Mathes adjacent to the city well field to measure the vertical gradient of contamination;
- sampling City Well Nos. 1, 3, and 4 and the GE Carnation well for the presence of volatile organic compounds;
- performing field groundwater quality tests on collected samples (i.e. pH, temperature, specific conductivity, oxidation/reduction potential) to ascertain whether proper development of the well had occurred prior to sampling;
- developing and submitting remedial action alternatives that may be implemented at the site. (As part of this evaluation, the feasibility of extending the cement grout around City Well Nos. 1 and 3 was examined.);

- o developing a map of private drinking water wells in the area near the identified waste disposal areas; and

- o collecting up-gradient and down-gradient water and sediment samples from Rock Creek, which runs adjacent to the city, to determine the chemical quality of water flowing around the site.

These objectives were met as described below. Any changes to the planned scope due to conditions other than anticipated are also described.

1. Selected published and open-file hydrogeologic and environmental information was reviewed and incorporated into this report.

2. Site investigation work plan, sampling plan, and health and safety plan documents were prepared and issued to the IEPA in June 1987.

3. A soil gas survey across specified areas around the city was performed in May 1987 in an attempt to identify sources and/or plumes of organic contamination.

4. A private well survey with the IEPA was performed at selected locations around the city in June 1987.

5. A subsurface exploration program consisting of eight geologic test boreholes ranging in depth from 22 to 239 feet was performed during June and July of 1987.

6. Two shallow and five deep groundwater monitoring wells were installed for the determination of piezometric levels and collection of groundwater samples. Variations from the original work plan are as follows:

   - o one well, G106D, was intended to be a deep, bedrock well, but was completed at a depth of 22 feet instead of 125 feet because the water table was encountered much shallower than anticipated;

   - o borehole G105D was drilled to a depth of 48 feet instead of the proposed depth of 125 feet because the hole collapsed in the bedrock at that depth;

- o borehole G104D was drilled to a total depth of 50 feet instead of 125 feet because the water table was encountered much shallower than anticipated;

- o borehole G102D was drilled to a total depth of 82 feet instead of 200 feet because the hole squeezed at 72 feet; and

- o borehole G101D was drilled to a total depth of 239 feet because shale was encountered deeper than anticipated.

7. Discrete interval groundwater samples from one deep borehole, G101D, were collected and analyzed for volatile organic compounds.

8. Groundwater samples from all Mathes-installed monitoring wells except G103S, which proved to be dry, were collected and chemically analyzed for HSL compounds by Method 624. Groundwater quality tests were conducted prior to collecting samples. Groundwater samples were also collected from City Well Nos. 1, 3, and 4, and the well located at the GE Carnation plant. Two surface water and sediment samples were collected from Rock Creek and one from the pond behind Ethan Allen. All groundwater and surface samples were analyzed for HSL volatile organic compounds by Method 624.

1.4 Overview of report

This report summarizes the results of the Phase I Remedial Investigation. Included in the report are the results of the field investigation, the data and hazards assessment, references, supplemental information and analytical results. The results of the field investigation, data and hazards assessment, references, and supplemental information are contained in Volume I of this report. Volume II contains laboratory results from Gulf Coast Laboratory.

The primary purpose of this report is to present relevant information from the field activities, identify data gaps, and preliminarily screen potential remedial actions.

2 INVESTIGATION SUMMARY

The site investigation was performed according to the scope of work as described in Section 1.3 of this report. The site investigation incorporated non-intrusive (soil gas survey and surface water and sediment sampling) and intrusive (subsurface geologic investigation and groundwater sampling) techniques in an attempt to identify potential source areas contributing to contamination of the city well field (City Wells 1, 2, and 3). The following sections briefly describe the techniques followed for conducting the specific investigations. More thorough descriptions of the techniques may be found in the Site Investigation Work Plan submitted to the IEPA on June 3, 1987.

2.1 Soil gas investigation

A soil gas investigation was conducted at the Morrison Site on May 5-8, 1987, by Tracer Research Corporation (Tracer) of Tuscon, Arizona, under subcontract to Mathes. The objective of this investigation was to provide information that would delineate potential sources and areas of volatile organic compound concentrations in the soil. Soil gas samples were collected at 60 locations around the city at depths ranging from two to five feet (depending on soil type and presence of water).

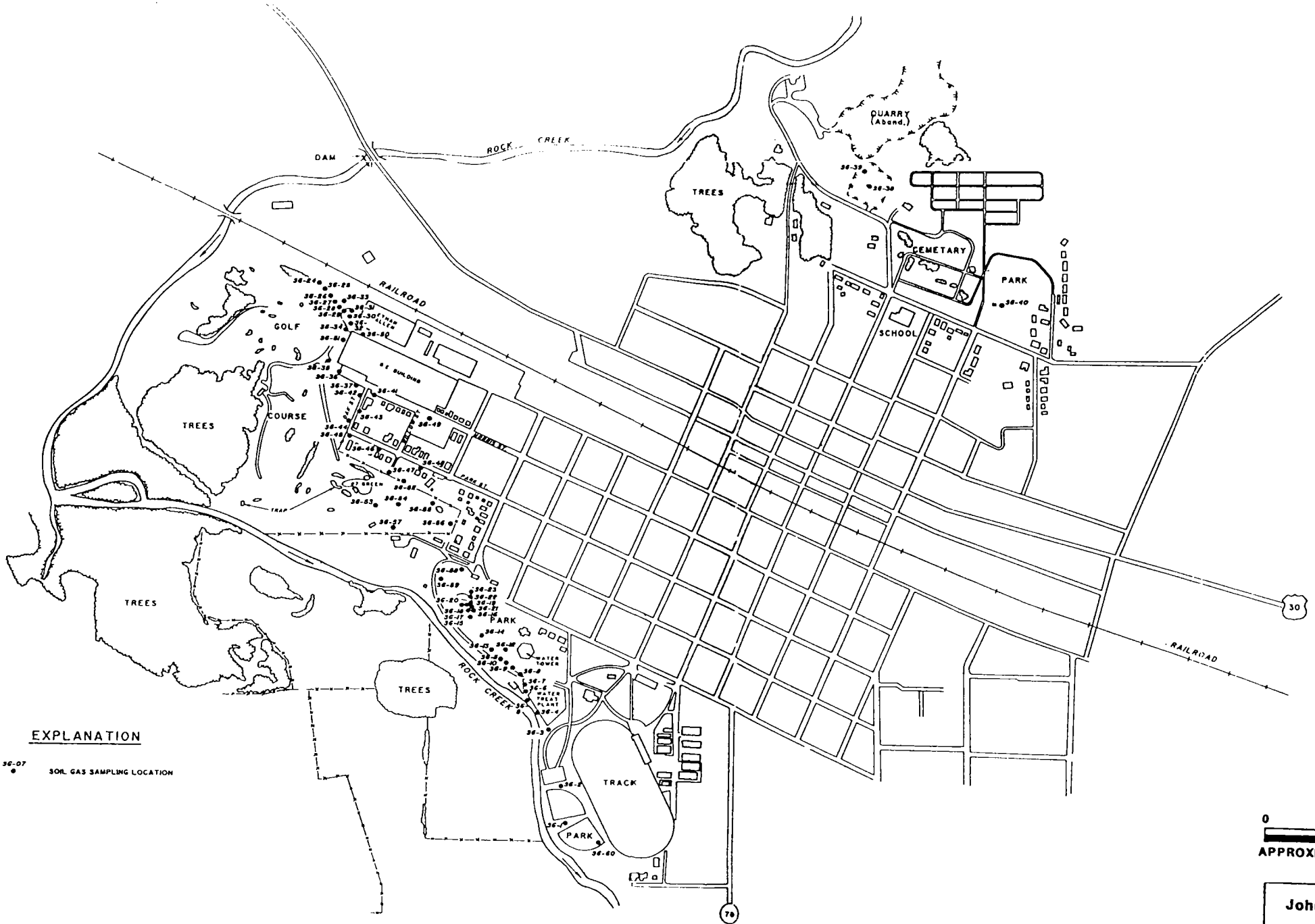
Analyses by Tracer were made for TCE, trichlorotrifluoroethane (F-113), 1,1,1-trichloroethane (1,1,1-TCA), and tetrachloroethene (PCE).

The results of the soil gas survey, as shown on Figures 2-1 through 2-6, indicate a potential source area may be located at the northwest corner of the General Electric building; a possible plume was defined trending southeast from this location. Other isolated soil gas anomalies were reported by Tracer, but obvious trends are not apparent.

The highest concentrations detected at this potential source area were TCE at 5700 and 4800 ug/L in the soil vapor. These measurements were at sampling locations having corresponding HNU readings of 500 and 100 needle deflection units, respectively. TCE concentrations dropped off rapidly as distance away from the possible source area increased. Concentrations detected in the soil gas samples at the landfilled areas for each of the compounds analyzed did not exceed 1.0 ug/L. The soil gas investigation report prepared by Tracer Research Corporation is included in Appendix A of this report.

2.2 Drilling

A total of eight geologic test boreholes, ranging in depth from 22 to 239 feet, were drilled by Mathes during the hydrogeologic investigation. At the completion of test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WATER TREAT PLANT
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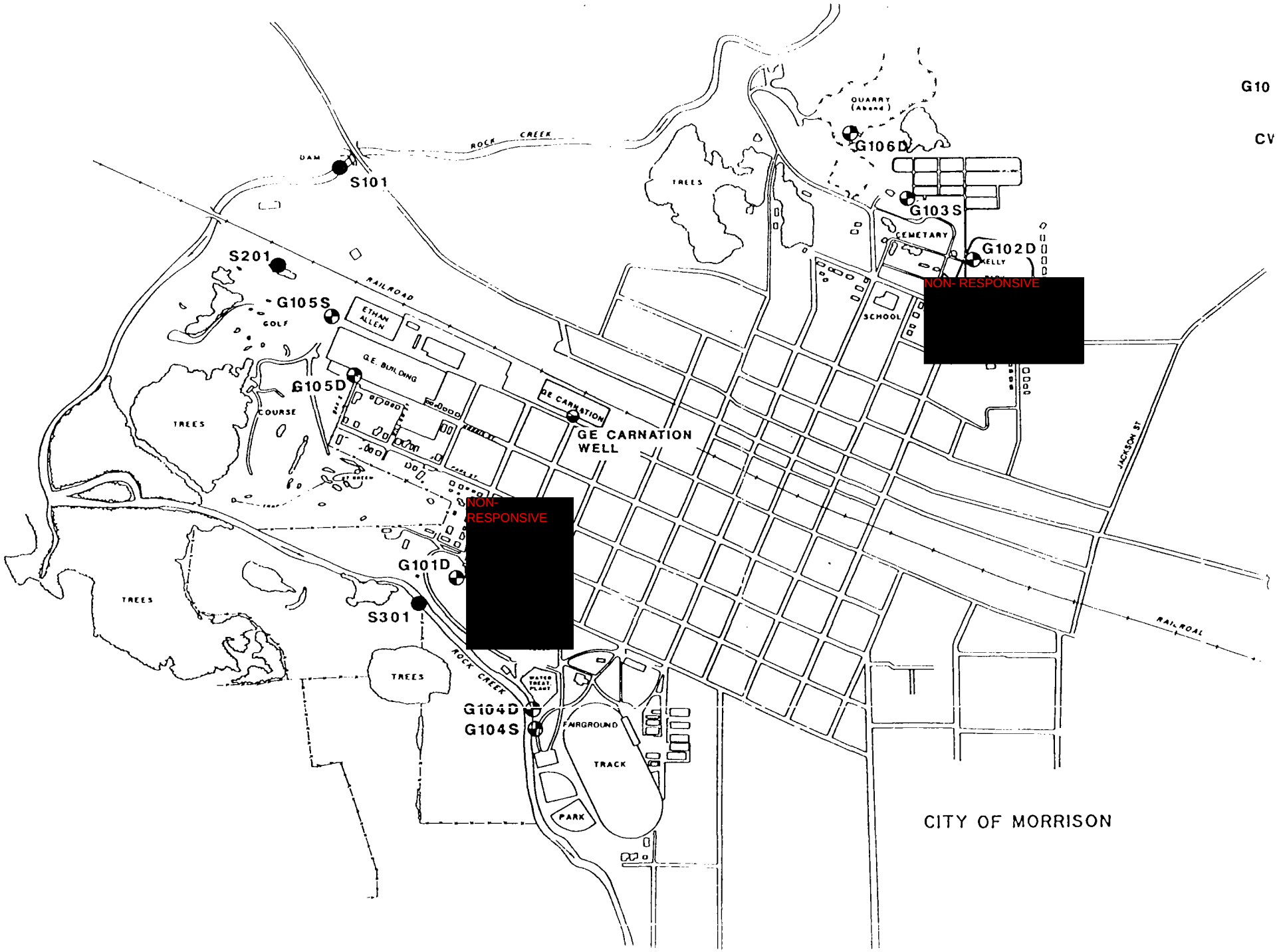
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S201
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SCHOOL
G.E. BUILDING
G105D
GE CARNATION
COURSE
TREES
GE CARNATION WELL
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G104D
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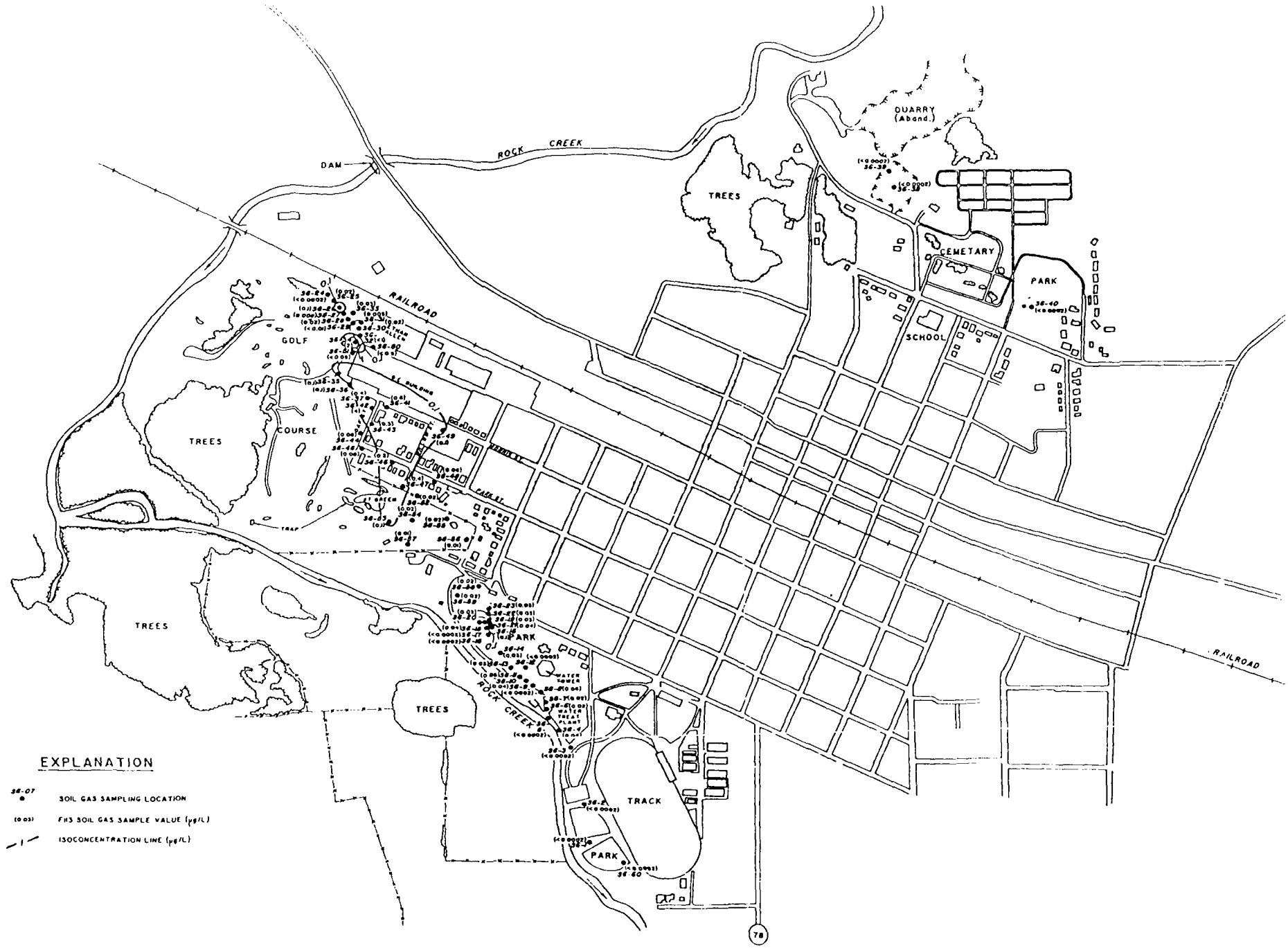
CITY OF MORRISON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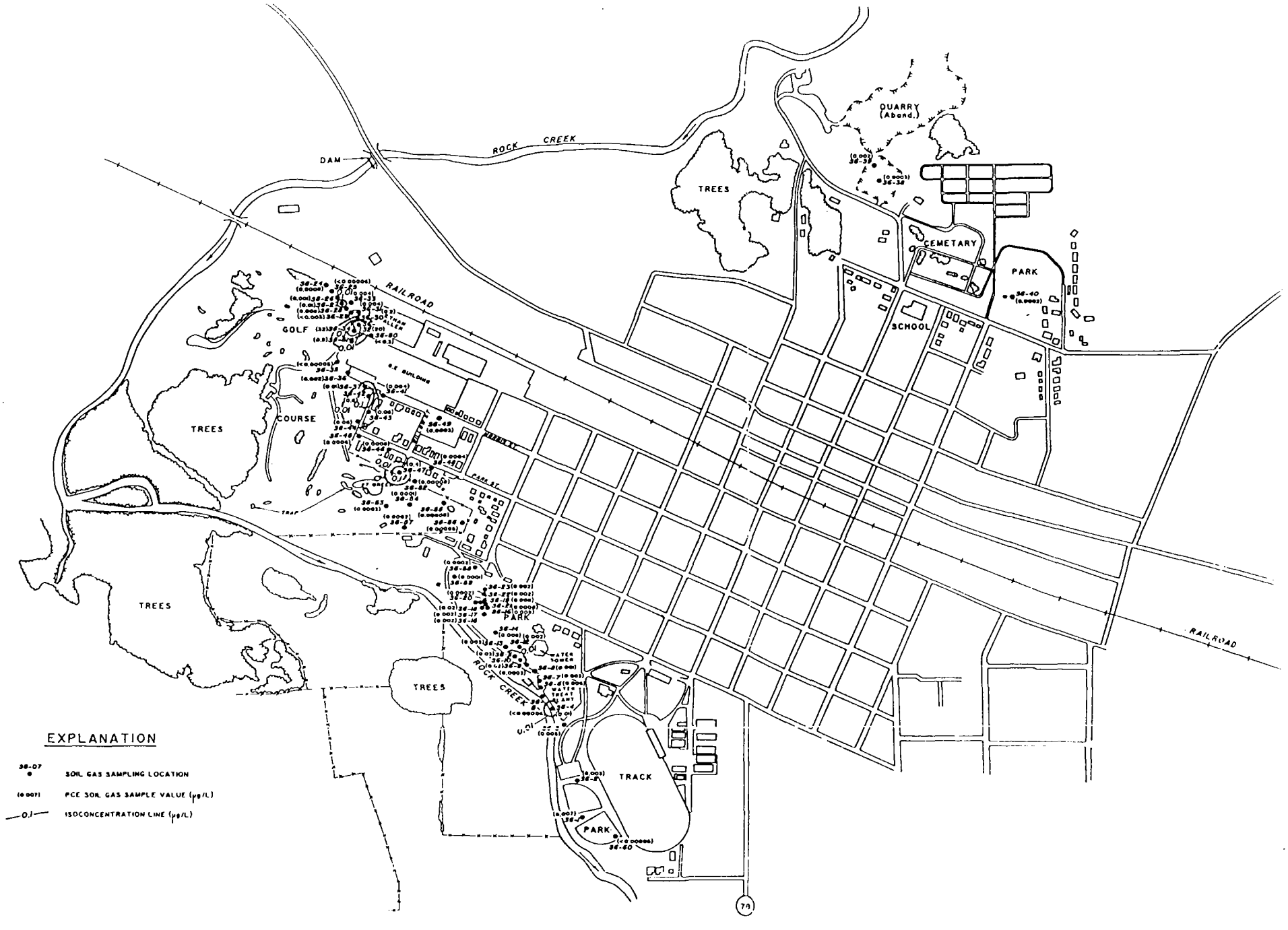
EXPLANATION
SOIL GAS SAMPLING LOCATION
FH3 SOIL GAS SAMPLE VALUE (µg/L)
ISOCONCENTRATION LINE (µg/L)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WATER TREATMENT PLANT
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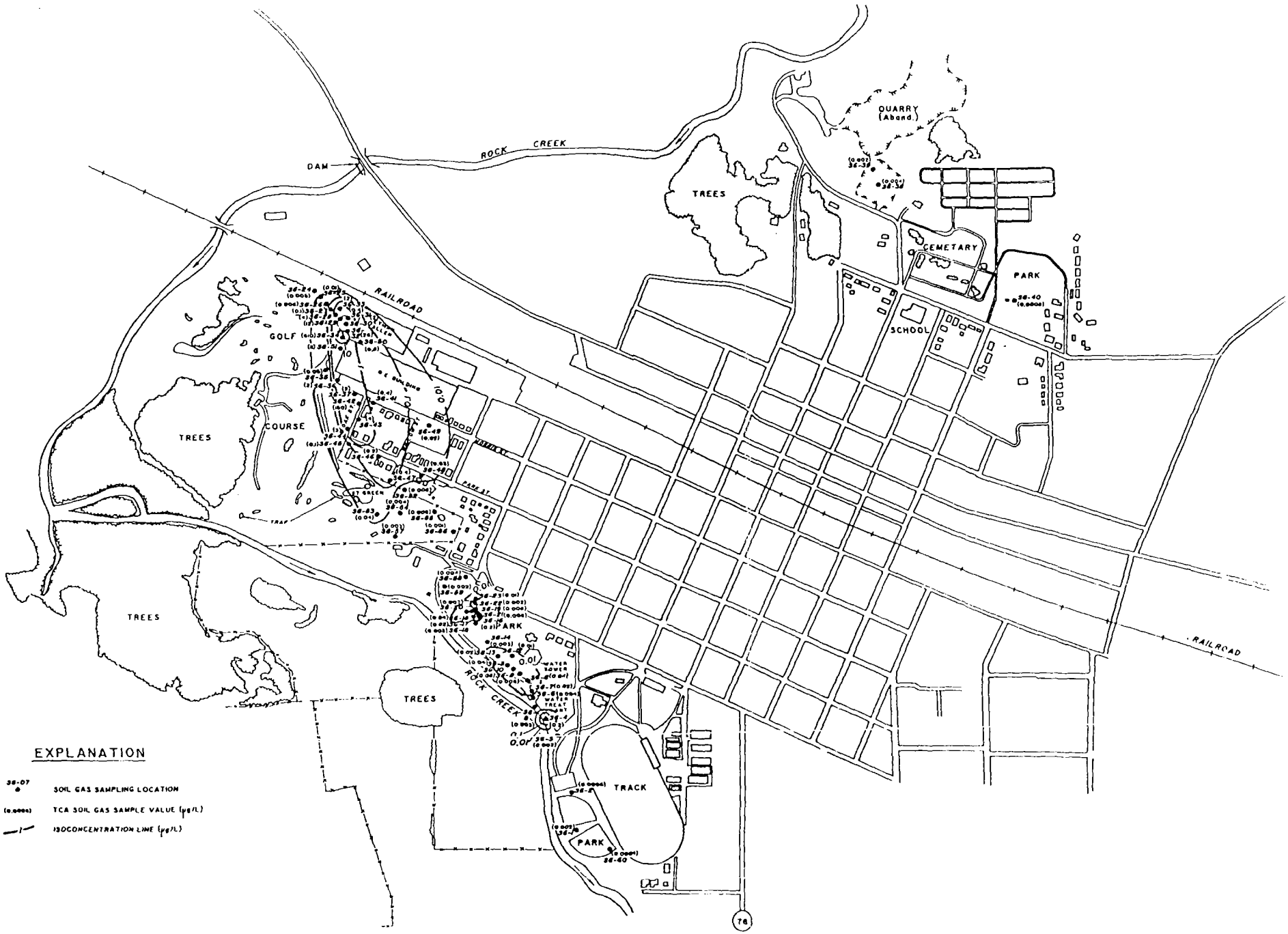
EXPLANATION
SOIL GAS SAMPLING LOCATION
PCE SOIL GAS SAMPLE VALUE (µg/L)
ISOCONCENTRATION LINE (µg/L)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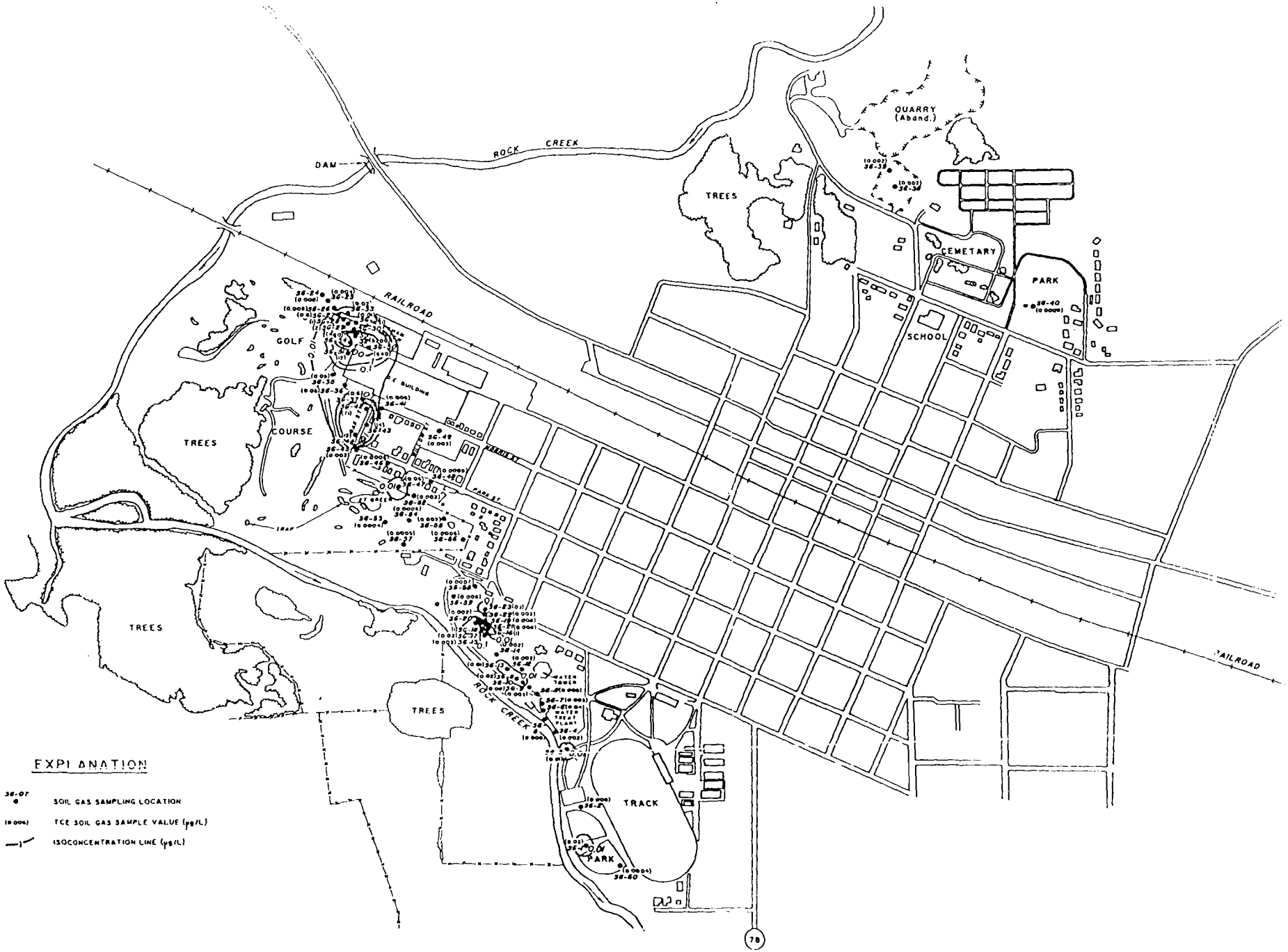
EXPLANATION
SOIL GAS SAMPLING LOCATION
TCA SOIL GAS SAMPLE VALUE (µg/L)
ISOCONCENTRATION LINE (µg/L)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ROCK CREEK
RAILROAD
78
EXPLANATION
SOIL GAS SAMPLING LOCATION
TCE SOIL GAS SAMPLE VALUE (µg/L)
ISOCONCENTRATION LINE (µg/L)

drilling activities, groundwater monitoring wells were installed in each borehole. The approximate location of each monitoring well is illustrated in Figure 2-6.

The geologic test boreholes were advanced using air rotary drilling methods. A drilling subcontractor, Earth Scientists, Inc., of St. Louis, Missouri, provided the exploration equipment and performed the actual drilling. The site supervisor, on-site geologist, and health and safety officer were provided by Mathes. The boreholes were logged by observation of the drill cuttings by the on-site geologist but samples were not collected. The geologic sequence for each test borehole is summarized on the appropriate geologic log contained in Appendix B. Interpretations of the geology were made by the on-site geologist and are based on the performance of the equipment and the nature of the cuttings brought to the surface by the drilling tools. The transition zone between lithologics appears to be gradual. Therefore, the field data represent both factual and interpretative information.

2.3 Groundwater monitoring well construction

Following drilling activities, groundwater monitoring wells were constructed in each borehole. The monitoring wells consist of two-inch diameter, No. 304 stainless steel screen and riser pipe. Where possible, Schedule-40, flush-thread

coupled, PVC pipe was utilized above the water level to complete the well to the surface. A maximum of fifteen feet of screen with machine-cut 0.010-inch slots was used in each borehole. Only 10 feet of screen was used to construct monitoring well G104S because of the shallow level of the water table. Stainless steel riser was emplaced above the screen to the surface, except at boreholes G102D and G104D where PVC riser was used above 10 feet of stainless riser.

Depths of screened intervals in the wells were chosen so that the most important stratigraphic/hydrologic units at the site could be monitored. Some variations from the proposed screened intervals occurred as a result of subsurface conditions at the site. Monitoring well G102D was intended to be screened 125 feet deep, but the hole caved at 72 feet and the deepest the well could be set was 82 feet. The screened interval for G103S was intended to intercept the shallow water in the near-surface soils; however, after constructing the well, the hole was found to be dry. The screened intervals for monitoring wells G104S and G105S were intended to intercept the shallow water in the surficial soils and were set accordingly. Monitoring well G105D was intended to be set below the water table in the bedrock, but the hole caved and the well was set as an interceptor well in the bedrock at a screen interval of 32.2 to 48.1 feet below ground surface. The screened interval for monitoring well G106D was set as intended to intercept the water table in the rock. Monitoring well G101D was set at the

most chemically impacted interval, as determined from the discrete interval sampling, which was in the bedrock at a screen interval of 223 to 239 feet below ground surface.

In each monitoring well, the borehole annulus was filled with filter sand from the base of the screen to three feet above the top of the screen. Above this sand pack, the borehole annulus was first sealed with a bentonite layer three feet thick and then filled to the surface with a bentonite-cement grout. The wells were completed at the surface with above-ground, locking well protectors. Construction diagrams for all Mathes installed monitoring wells are presented in Appendix C.

2.4 Discrete-interval groundwater sampling

Discrete-interval groundwater sampling was performed in monitoring well G101D on June 20-21, 1987, using a dual straddle packer sampling system. The purpose was to identify the zone of greatest organic impact by sampling isolated intervals of groundwater.

The dual straddle packer sampling system consists of two inflatable rings placed above and below a section of the well screen. Discrete intervals of groundwater were collected starting at a depth of 237 feet below ground surface. The samples were collected at 15 to 25 foot intervals from that starting point to a depth of 30 feet below ground surface. The

sampling depth intervals and elevations are presented in Table 2-1. Six samples were collected. Samples were analyzed by Gulf Coast Laboratories, Inc., (Gulf Coast) of University Park, Illinois, for HSL volatile organic compounds by Method 624.

2.5 Composite groundwater sampling

On June 29-30, 1987, groundwater samples were collected from the Mathes-installed monitoring wells, from the GE Carnation well, and from City Well Nos. 1, 3, and 4. Prior to obtaining the samples, the Mathes field personnel measured the pH, specific conductivity, temperature and oxidation-reduction potential to verify static conditions of the formation water prior to sampling. The results of these field tests are included in Appendix D of this report.

Samples were collected using a clean, Teflon bailer. Samples were obtained within 24 hours of well development, cooled to $4^{o}C$ immediately after collection, and shipped to the laboratory on the day of collection. The well development and water sampling forms are in Appendix D of this report.

Gulf Coast provided the sample containers and the appropriate preservatives. Strict chain-of-custody procedures and documentation were followed. The chain-of-custody records are on file with the IEPA.

Section 6 of this report is a discussion of the results of this groundwater sampling effort.

Table 2-1

DEPTH INTERVALS OF DISCRETE-INTERVAL GROUNDWATER SAMPLING

CITY OF MORRISON, ILLINOIS
JUNE 20-21, 1987

Sample Number	Depth* (feet)	Elevation** (feet)
G101D-1	234-211	389.9-412.9
G101D-2	213-190	410.9-433.9
G101D-3	193-170	430.9-453.9
G101D-4	153-130	470.9-493.9
G101D-5	113- 90	510.9-533.9
G101D-6	53- 30	570.9-593.9

* Below ground surface
** Above mean sea level

Source: Mathes, 1987.

2.6 Surface water and sediment sampling

Surface water and sediment samples (sample sets) were collected from Rock Creek and the pond behind Volkmans/Ethan Allen at the locations shown in the sample location map (Figure 2-6). The samples obtained from Rock Creek include: one sample set from an up-gradient location (S101), and two sample sets from down-gradient locations (S301 and S302). One sample set was obtained from the pond (S201).

The water samples were collected using a clean, Teflon, point-source bailer so that a composite sample could be obtained. Field measurements, including pH, specific conductance, temperature, and dissolved oxygen, were made prior to collecting the sample. The samples were collected from the deepest part of the water accessible by wading.

The sediment samples were collected using a modification of USEPA Method II-4; Sampling Sludge or Sediments with a Hand Corer (USEPA-600/4-84-076, 1984). An undisturbed sample was collected so that depositional information could be preserved. The samples were transferred into a sample jar with a Teflon-lined cap, placed into a cooler and cooled to 4^{o}C. The samples were then shipped to Gulf Coast following proper chain-of-custody procedures. Copies of the sampling documentation are in Appendix E of this report. Chain-of-custody records are on file with the IEPA.

2.7 Private well survey

On July 2, 1987, personnel from Mathes and the IEPA conducted a survey of private wells located in the vicinity of the City of Morrison. The survey included contacting owners of the wells and obtaining information about the construction and usage of the wells. Table 2-2 presents a list of the owners contacted, the locations of the wells, and any information supplied by the owner.

2.8 Miscellaneous field tests and measurements

The miscellaneous field tests and measurements listed below were performed by Mathes environmental personnel or Mathes subcontractors during the course of the site investigation.

1. Geologic test borehole/monitoring well elevations and creek sampling point elevations were measured by surveying to 0.01-foot vertical accuracy. L. F. Van der Schaff Surveyors of Morrison, Illinois, performed the survey. Horizontal control was not surveyed.

2. Land surface and top of the well riser pipe and steel protector casing at each Mathes monitoring well were also surveyed by L. F. Van der Schaff Surveyors. The elevations of the top of the riser pipe and protector casing, and the creek sampling locations were surveyed to the nearest 0.01 foot. Land surface elevations were surveyed to 0.1 foot accuracy.

3. The depth to groundwater was measured at the time of completion of each borehole, after well installation, and prior to well development and sampling.

4. The total depths of the wells were measured to the nearest 0.1 foot using a clean, weighted tape.

Table 2-2

PRIVATE WELL SURVEY LIST

CITY OF MORRISON, ILLINOIS
JULY 2, 1987

Location Number	Owner's Name/Address	Approximate Location	Well Information Supplied by Owner
NON- RESPONSIVE			Drilled Well TD-40' Basement Pump Rusted Tested by Chicago-EPA Tested by Health Dept.
			Well TD-Unknown Well Located by Barn (Northside)
			No Well Information
			No Well Information?
			Well TD-Approximate-70' Cased-depth unknown
			No Well Information?
			No well information
			New Well 11 or 12 years old

TD = Total depth of well.

Note: Wells surveyed by Kerry Keller of IEPA and Craig Maxeiner of John Mathes & Associates, Inc., on July 2, 1987.

3 SAMPLE ANALYSIS

Groundwater samples for chemical analysis were collected from all wells except G103S, which did not yield sufficient water. Soil samples were not collected from any location.

3.1 Groundwater sample chemical analysis

The various types of groundwater samples were analyzed differently as described below.

3.1.1 Discrete-interval groundwater samples

The six discrete-interval groundwater samples collected from monitoring well G101D on April 29, 1987 were analyzed by Gulf Coast for HSL volatile organic compounds. These samples were analyzed according to USEPA Method 624 (GC/MS).

3.1.2 Composite groundwater samples

Gulf Coast analyzed the groundwater samples collected during this investigation from the eight monitoring wells installed by Mathes, the GE Carnation well, and City Well Nos.

1, 3, and 4. In addition, a duplicate sample (G105D-DUP) from monitoring well G105D, two trip blanks, and one bailer (sampling) blank were analyzed for QA/QC purposes.

The groundwater samples collected from the monitoring wells installed by Mathes were analyzed for HSL compounds. USEPA Method 624 (GC/MS) was followed for the organic compounds and USEPA Method 6010 (ICAP) was followed for the inorganic elements. The samples from the city wells and from the GE Carnation well were analyzed for only HSL volatile organic compounds, according to USEPA Method 624 (GC/MS). In addition, a National Bureau of Standards (NBS) library search was performed to identify any additional volatile organic compounds detected during the analysis. The analytical results are presented in Section 6 of this report.

General water quality parameters were measured prior to and during sampling events by Mathes field personnel.

3.2 Surface water and sediment sample chemical analysis

The surface water and sediment samples collected from Rock Creek and from the pond behind Volkmans/Ethan Allen on June 30, 1987, were analyzed by Gulf Coast for HSL volatile organic compounds using USEPA Method 624 (GC/MS).

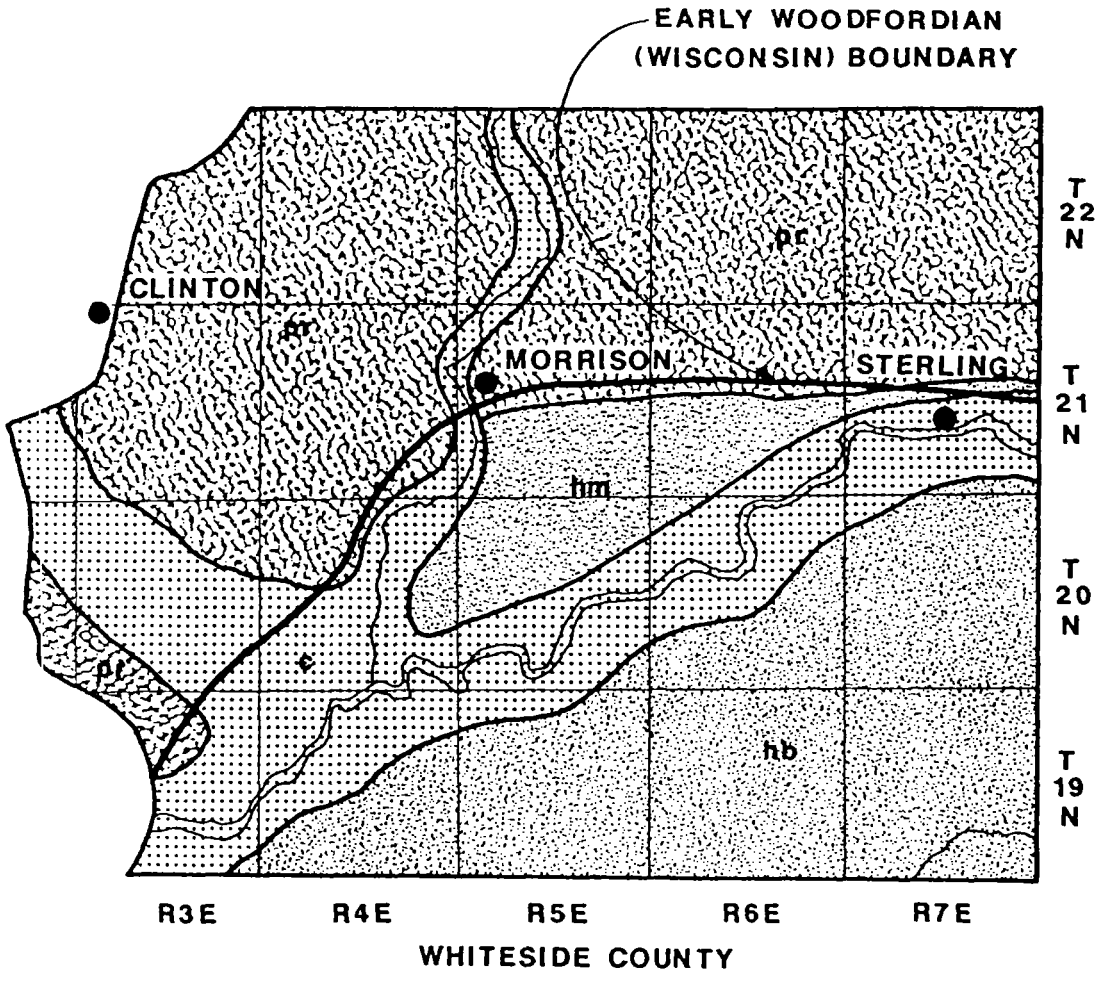
4 REGIONAL HYDROGEOLOGY

The hydrogeology in the vicinity of Morrison and throughout Whiteside County consists of a complex relationship between surficial unconsolidated deposits and underlying bedrock. Multiple episodes of erosion and deposition caused by several glacial advances and retreats throughout the area have interacted to form the present surface and subsurface features. (Local and site specific conditions pertaining to the Morrison site are presented in Section 5-Site Hydrogeology.)

4.1 Geomorphology

The City of Morrison is physiographically situated in the Rock River Hill Country Area of the Till Plains Section of the Central Lowland Province. Morrison is located just north of the Rock River and Green River Lowlands area on the south edge of an Illinoian ground moraine. The line that separates the southern lowlands from the northern hills and plains corresponds to an Early Woodfordian (Wisconsin) glacial end moraine as shown, along with the regional geology, in Figure 4-1.

The current geomorphological features in the area have been formed primarily by the advance and retreat of Illinoian, and to a lesser extent Wisconsin, glaciers. These features consist of exposed Silurian dolomite bedrock and thin glacial drift



EXPLANATION

pr — PEORIA LOESS AND ROXANNA SILT

hm, hb — HENRY FORMATION (SANDS & GRAVELS)

c — CAHOKIA ALLUVIUM

N

NOT TO SCALE

John Mathes & Associates, Inc.	
REGIONAL SURFICIAL GEOLOGY	
12872832	FIGURE 4-1

plains to the north of Morrison and outwash sand-and-gravel-filled valleys to the south.

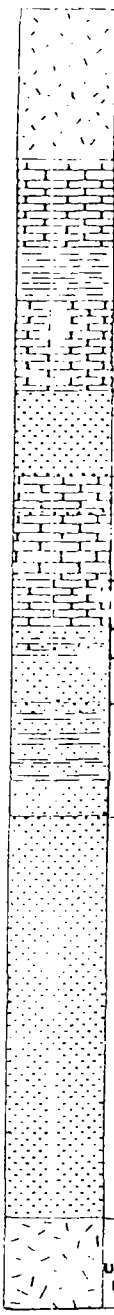
4.2 Geology

The uppermost geologic materials in the Morrison area are reported to vary from windblown silts (loess), sands, clays, and glacial drift, to localized areas of exposed bedrock. The Illinoian-stage ground moraine drift (Glasford formation) consists of materials ranging from fine-grained till to sand and gravel. The sand and gravel are glacial outwash valley fill deposits and are locally underlain by a layer of fine-grained till, especially in areas where the bedrock surface elevation is lower than approximately 575 feet (Foster, 1956).

Unconsolidated deposits in the Morrison area range in thickness from a maximum of 100 feet in the upland areas to greater than 200 feet in lowland areas. In the upland areas, as much as 25 feet of Wisconsin loess may overlie bedrock or thin layers of glacial drift.

Figure 4-2 illustrates a generalized stratigraphic section representative of the Morrison area. The uppermost bedrock units are Silurian age dolomites (Niagaran and Alexandrian). These dolomites, which are typically fractured and cherty, are separated from the underlying Cambrian and Ordovician sandstones and dolomites by Ordovician-age Maquoketa shales.

GENERALIZED SECTION OF GEOLOGIC/HYDROLOGIC UNITS



THICKNESS (FT)	ROCK CLASSIFICATION	AQUIFER/HYDROLOGIC CHARACTERIZATION
0-605 ±	Unconsolidated glacial drift—silt, clay and, in many areas, water-yielding sand and gravel	DEPENDANT UPON THICKNESS. THICKENS TO THE SOUTH GENERALLY AND IN BEDROCK CHANNELS.
0-350 ±	Silurian dolomite (Niagaran-Alexandrian)	USED EXTENSIVELY. CHERTY ZONES. YIELDS DEPENDENT ON THICKNESS & FRACTURES.
0-210 ±	Maquoketa shale and dolomite	NOT USED AS AN AQUIFER.
350-380	Galena-Platteville dolomite	USED AS DOMESTIC FARM SUPPLY.
50-350	Glenwood-St Peter sandstone	USED AS DOMESTIC TO INDUSTRIAL SUPPLY.
0-420 ±	Prairie du Chen dolomite and thin sandstone	NOT COMMONLY USED. MAY SUPPLY SMALLER DEMANDS.
0-175 ±	Trempealeau dolomite	NOT COMMONLY USED UNLESS IN CONJUNCTION WITH GALESVILLE OR MT. SIMON.
70-115	Franconia sandstone and shale.	
125-180	Ironton-Galesville sandstone	USED EXTENSIVELY.
400-450	Eau Claire sandstone and shale	NOT COMMONLY USED UNLESS IN CONJUNCTION WITH GALESVILLE OR MT. SIMON.
1800 ±	Mt Simon sandstone.	UPPER PORTIONS OFTEN USED IN MUNICIPAL & INDUSTRIAL WELLS. WATER MAY BE OF POOR QUALITY (MINERALIZED).
TO UNKNOWN DEPTHS	Granite	NOT USED AS AN AQUIFER.

Modified from (Foster, 1956)

John Mathes & Associates, Inc.	
GENERALIZED STRATIGRAPHIC COLUMN	
12872832	FIGURE 4-2

The Ordovician and Cambrian formations consist of approximately 50 percent sandstones and consecutively lesser percentages of dolomites, limestones, and shales.

In Whiteside County, these formations dip gently to the southwest at approximately 25 feet per mile (Foster, 1956). They remain relatively flat-lying and intact eastward to the Sandwich fault zone in northeastern Lee County.

Based on the log of approximate geologic conditions from the City Well No. 3, the geologic succession is as follows:

Formation or Material	Base Elevation*	Thickness
Glacial drift (Glasford)	92 feet	92 feet
Silurian Dolomite	255 feet	163 feet
Maquoketa Shale	443 feet	188 feet
Galena Dolomite	791 feet	348 feet
St. Peter Sandstone	918 feet	127 feet
Trempealeau Dolomite	1,485 feet	567 feet
Galesville Sandstone	1,620 feet	135 feet

*Above mean sea level.

4.3 Groundwater hydrology

Figure 4-2 illustrates the relationship between the previously described geologic units and the hydrologic units in the vicinity of Morrison. Significant water bearing units include unconsolidated deposits (loess, sand and gravel valley fill, and glacial drift), Silurian-age dolomite, and Cambrian/Ordovician-age sandstones and dolomites.

The unconsolidated deposits and the underlying Silurian dolomites form one hydrologic unit where the fine-grained glacial lodgement till has been eroded or was not deposited. In these areas, the fractured dolomites may be a highly prolific aquifer receiving recharge from the overlying saturated unconsolidated materials. In upland areas where the surficial glacial-related deposits are thin, the unconsolidated materials are usually not an adequate source of groundwater when underlain by lodgement till. The most prolific aquifers in the area are hosted by thick deposits of sand and gravel located along the Rock and Green River valleys, and along the Rock Creek valley south of Morrison. Some groundwater wells in Whiteside County have penetrated 200 to 300 feet of outwash sands and gravels and have allowed safe yields in the range of 600 to 1000 gallons per minute.

Groundwater encountered in the Silurian dolomites (where separated from the overlying water-bearing deposits by fine-grained till) is considered usable for domestic or farm use. The wells must intercept fractures in the dolomites that are water-bearing. The underlying Maquoketa shale is rarely used for a water supply, and then only in areas far to the northeast of Morrison where the Silurian dolomites are not present and the glacial deposits directly sit on fractured shales. For areas in and surrounding Morrison, the Maquoketa shale is considered non-water-bearing and a confining unit.

At depths below the Maquoketa shale, several formations are considered prolific aquifers. The most prolific aquifer is the

Cambrian-age Ironton-Galesville sandstone. Other formations also considered prolific include, from youngest to oldest, the Ordovician-age Galena-Platteville dolomite, Glenwood-St. Peter sandstone, Trempealeau dolomite, and the Cambrian-age Mt. Simon sandstone. No major confining layer exists in the Cambrian/Ordovician-age formations and in most areas these are considered one hydrologic unit.

5 SITE HYDROGEOLOGY

5.1 Geology

The shallow geologic sequence in the City of Morrison consists of unconsolidated Pleistocene-age glacial and alluvial deposits overlying a highly irregular Silurian bedrock surface. Bedrock units identified on-site include Silurian-age Niagaran-Alexandrian dolomite overlying Ordovician-age Maquoketa shale.

Table 5-1 presents selected monitoring well and geologic data compiled from the monitoring well test boreholes installed by Mathes, from well logs of the city wells and the GE Carnation well, and from six test boreholes drilled by the City in 1954 for the purpose of locating potential water supplies for the city.

Figure 5-1 is a map showing the locations of generalized hydrogeologic cross sections at the site. Cross Sections A-A' (Figure 5-2) and B-B' (Figure 5-3) are oriented approximately northwest-southeast along transects in the southern and northern portions of the city, respectively. In the southern portion of the city, the uppermost geologic units are sands and gravels and glacial drift (see Figure 5-2). The glacial drift is reported to include silts and clays as well as sand and gravel deposits (Foster, 1956). (Because samples were not obtained by Mathes during drilling, a distinction cannot be made between sands and gravels of alluvial versus glacial

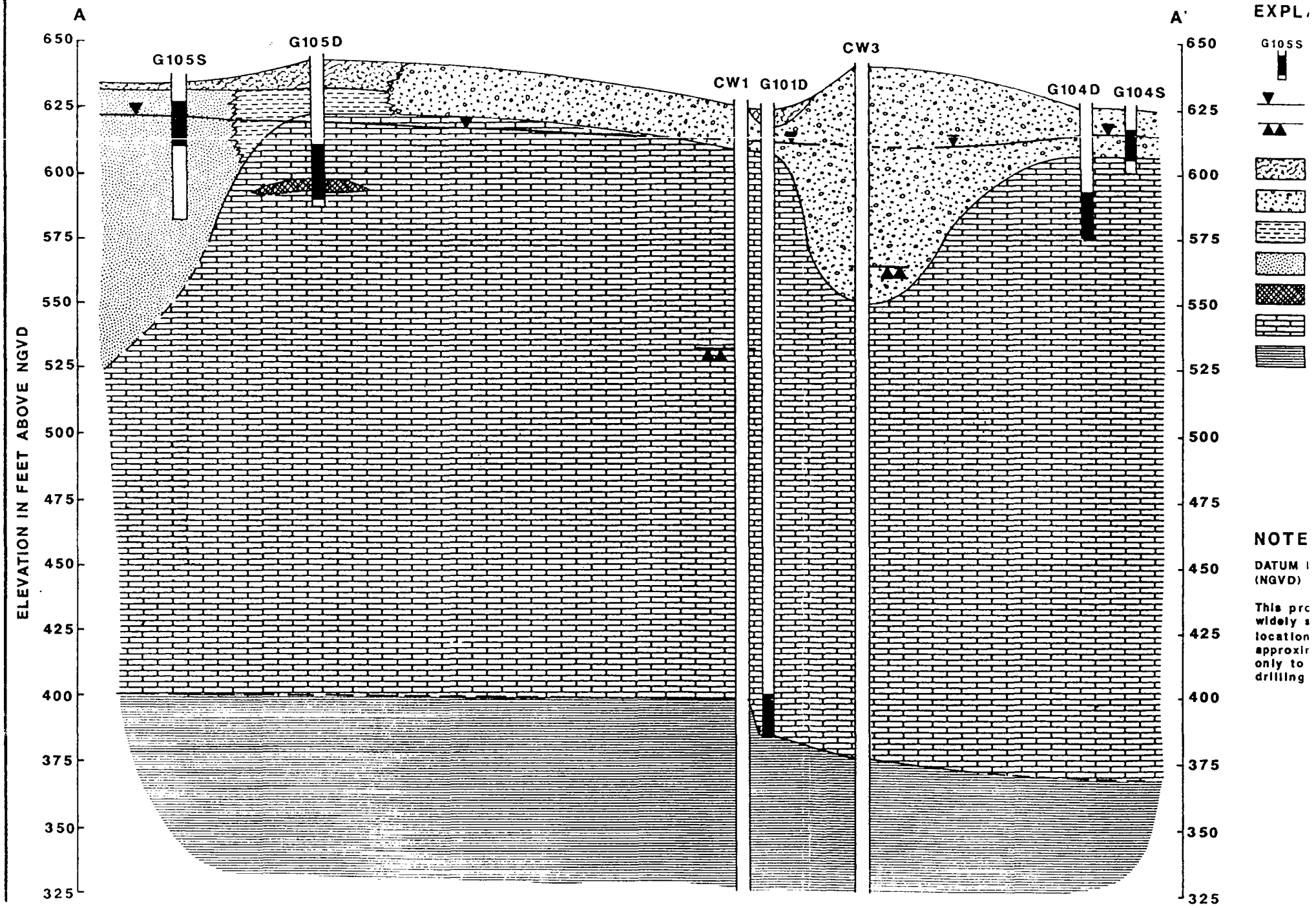
Table 5-1

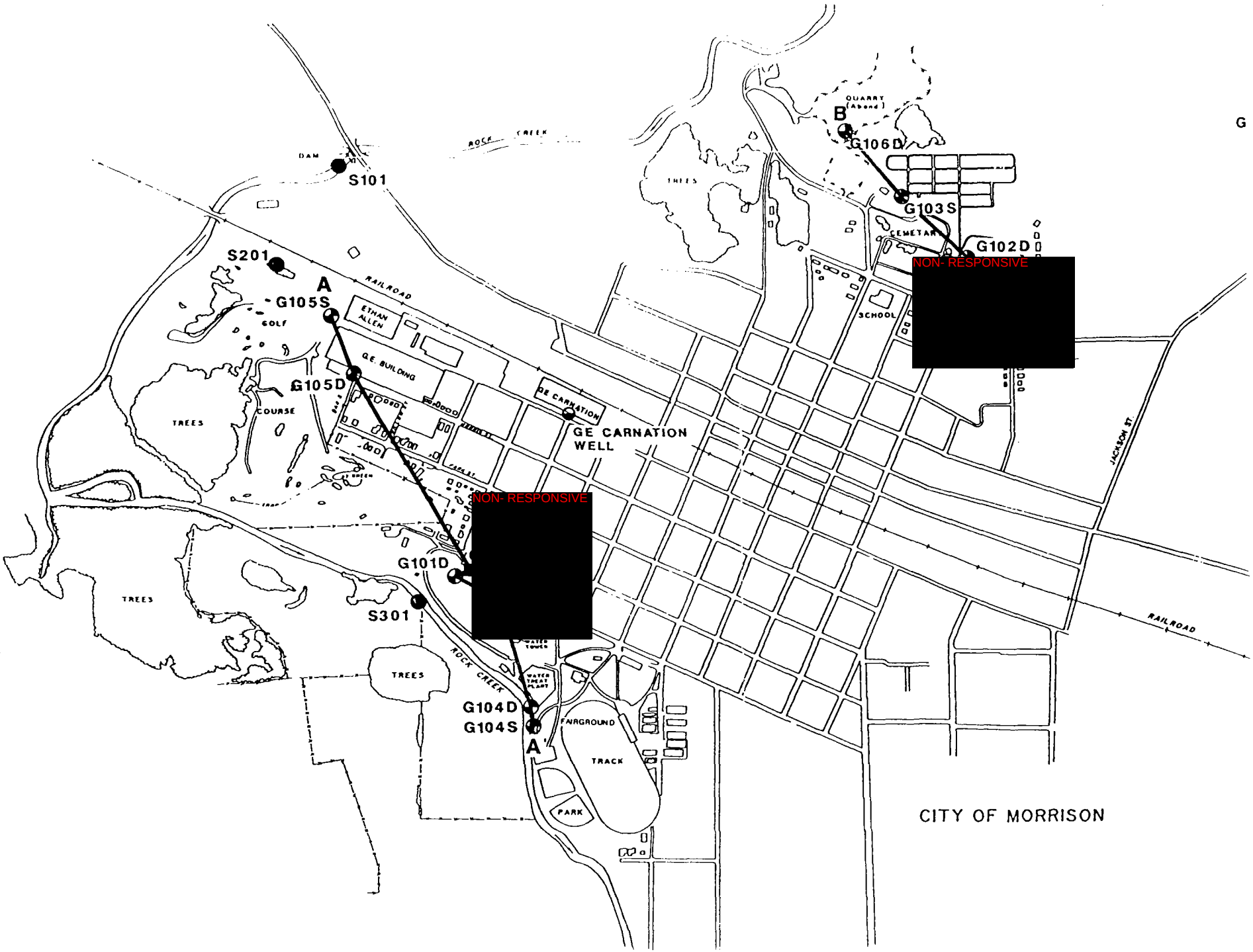
MONITORING WELL AND GEOLOGIC INFORMATION

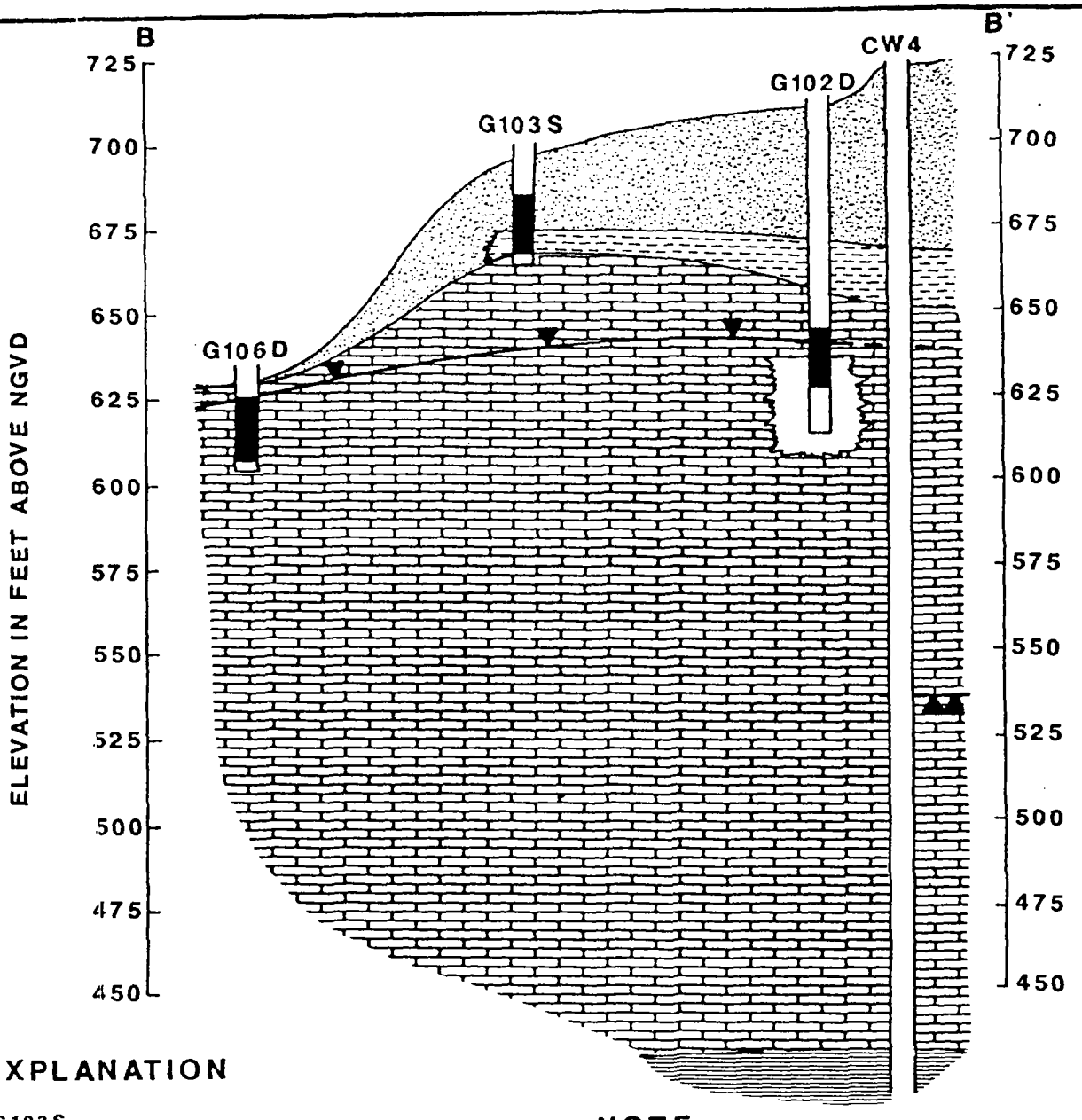
CITY OF MORRISON, ILLINOIS
JULY, 1987

Well Number	Ground Surface Elev.	Total Depth Elev.	Water Level Elev.*	Top of Rock Elev.	Top of Shale Elev.	Screened Interval
G101D	623.9	384.9 (239)	612.6 (11.3)	607.9 (16)	386.9 (237)	384.9-400.9 16 **
G102D	711.7	612.7 (99)	638.3 (73.3)	656.2 (55.5)	N/A N/A	629.5-645.4 15.9**
G103S	696.7	664.7 (32)	DRY	665.9 (30.8)	N/A N/A	669.2-685.2 16 **
G104S	624.3	600.4 (23.9)	614.4 (9.8)	605.3 (19)	N/A N/A	606.6-617.1 10.5**
G104D	624.6	574.6 (50)	615.5 (9.1)	605.6 (19)	N/A N/A	575.6-591.6 16 **
G105S	634.2	581.2 (53)	621.1 (13.1)	N/A N/A	N/A N/A	610.2-626.2 16 **
G105D	642.1	586.2 (55.9)	619.5 (22.6)	623.1 (19)	N/A N/A	594.0-609.9 15.9**
G106D	632.4	604.4 (28)	622.9 (9.4)	628.4 (4)	N/A N/A	609.9-625.9 16 **
CW 1	625	 (-1645)	N/A N/A	610 (15)	400 (225)	---------- ----------
CW 3	640	 (-1625)	562 (78)	551 (89)	383 (257)	---------- ----------
CW 4	715	 (-1769)	535 (180)	651 (64)	347 (368)	---------- ----------
GE WELL	670	 (-1101)	610 (60)	570 (100)	363 (307)	---------- ----------
TH1	640	564 (76)	N/A N/A	565 (75)	N/A N/A	---------- ----------
TH2	645	492 (153)	N/A N/A	493 (152)	N/A N/A	---------- ----------
TH3	635	605 (30)	N/A N/A	627 (8)	N/A N/A	---------- ----------
TH4	635	585.5 (49.5)	N/A N/A	587 (48)	N/A N/A	---------- ----------
TH5	630	600 (30)	N/A N/A	616 (14)	N/A N/A	---------- ----------
TH6	625	552 (73)	N/A N/A	552? (73?)	N/A N/A	---------- ----------

* = Measured prior to sampling.
** = Length of screen interval.
CW 1 = City Well.
G101D = Mathes-installed wells.
N/A = Data not available.
TH1 = City test borehole.
Note: Elevations are in feet above mean sea level. All numbers in parentheses are in feet below ground surface.


A
A'
G105S
G105D
CW3
CW1
G101D
G104D
G104S
650
625
600
575
550
525
500
475
450
425
400
375
350
325
ELEVATION IN FEET ABOVE NGVD
EXPL
G105S
NOTE
DATUM
(NGVD)
This pro
widely s
location
approxir
only to
drilling


S101
DAM
ROCK CREEK
S201
A
G105S
G105D
RAILROAD
ETHAN ALLEN
GOLF
COURSE
TREES
G.E. BUILDING
GE CARNATION
GE CARNATION WELL
NON- RESPONSIVE
G101D
S301
TREES
ROCK CREEK
WATER TOWER
WATER TREAT PLANT
G104D
G104S
A
FAIRGROUND
TRACK
PARK
B
QUARRY (Abond.)
G106D
TREES
G103S
CEMETARY
G102D
NON- RESPONSIVE
SCHOOL
JACKSON ST.
RAILROAD
CITY OF MORRISON



EXPLANATION

G103S — GROUNDWATER MONITORING WELL WITH SCREEN

SHALLOW AQUIFER WATER LEVEL ELEVATION

DEEP AQUIFER POTENTIOMETRIC SURFACE (IN 1951)

LOESS

TILL

VOID

NIAGARAN-ALEXANDRIAN DOLOMITE

MAQUOKETA SHALE

NOTE

This profile was developed by interpolation between widely spaced boreholes. Only at the borehole locations should it be considered as an approximately accurate representation and then only to the degree implied by the notes on the drilling logs.

VERTICAL SCALE IN FEET
0 50 100

0 400 800
HORIZONTAL SCALE IN FEET

DATUM IS NATIONAL GEODETIC VERTICAL DATUM (NGVD)

John Mathes & Associates, Inc.

HYDROGEOLOGIC CROSS SECTION B - B'

12872832

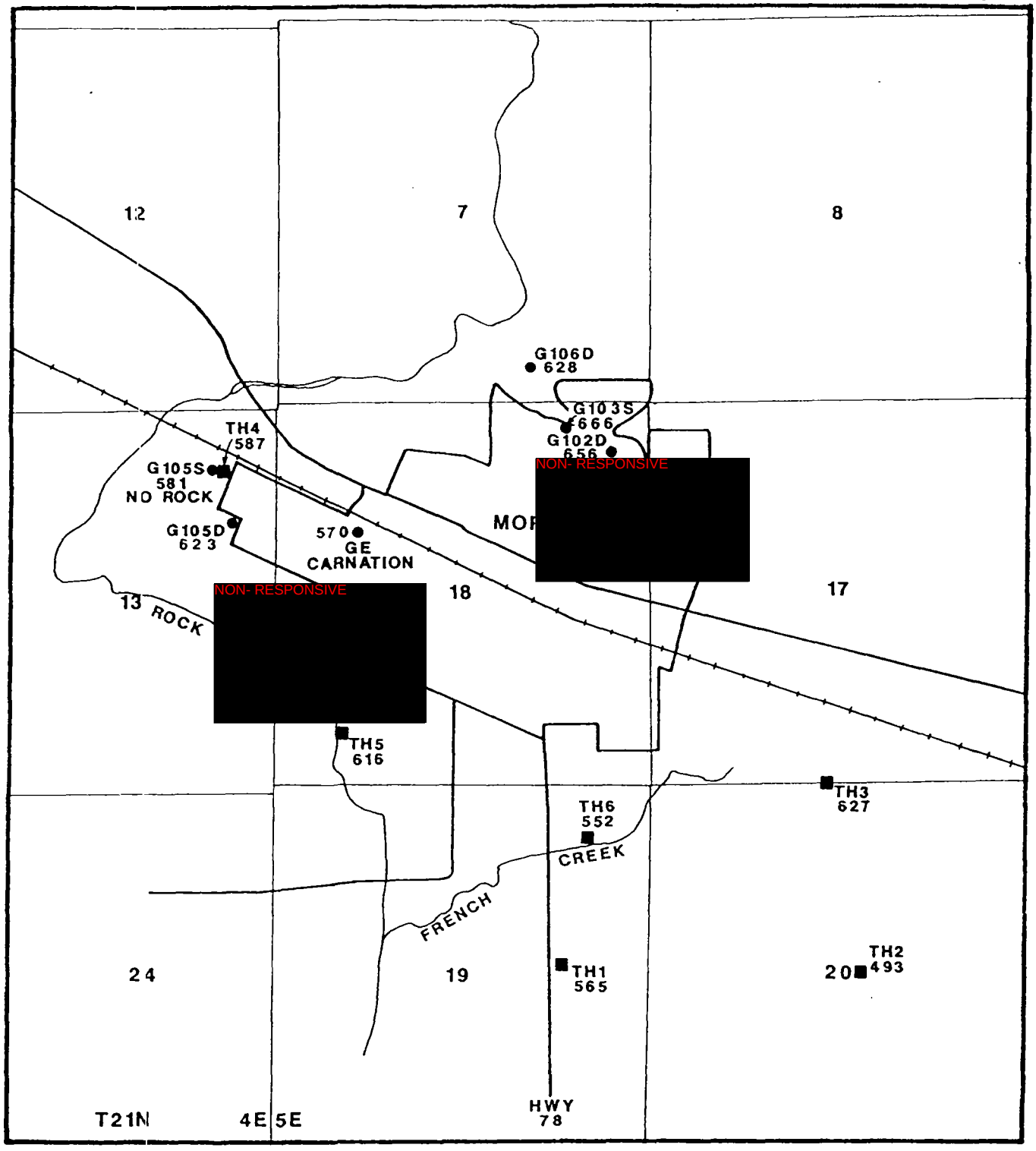
FIGURE 5-3

origin at these locations). Bedrock apparently lies below and in contact with the sand and gravel deposits.

Wind blown deposits of fine-grain silt (loess) are the uppermost geologic unit found in the northern portion of the city. These deposits occur on the hilltops in the areas of higher elevation (Figure 5-3). In general, the loess unit ranges in thickness from 25 to 50 feet in this area. The loess is described as a calcareous, brown, clayey silt that contains some traces of sand. Underlying the loess is approximately ten feet of a fine-grained till. The till is described as a brown to red-brown silty clay that is calcareous in nature. The bedrock lies below the till in areas of higher elevation.

Bedrock below the City of Morrison consists primarily of limestone and dolomite units belonging to the Silurian-age Niagaran-Alexandrian dolomite formation. Niagaran-Alexandrian dolomite is described as being light gray to brown in appearance, with abundant cracks and openings, and contains hard chert fragments in many places.

The irregular nature of the top of bedrock across the city can be observed on Figure 5-4. More than 75 feet of relief is present on this surface. The elevation above mean sea level (AMSL) of the bedrock surface ranges from almost 666 feet to approximately 493 feet. As can be seen from Figure 5-4, the bedrock surface is irregular. Using bedrock elevations from Mathes wells G102D (in the northern portion of the site) and G101D (in the southern portion of the site), a slope of



EXPLANATION

- G105S ● GROUNDWATER MONITORING WELL
- CW3 ● CITY WELL
- TH3 ■ 1954 TEST BOREHOLE
- 616 TOP OF BEDROCK ELEVATION

ELEVATIONS ARE IN FEET ABOVE MEAN SEA LEVEL

0 2000 4000
SCALE IN FEET

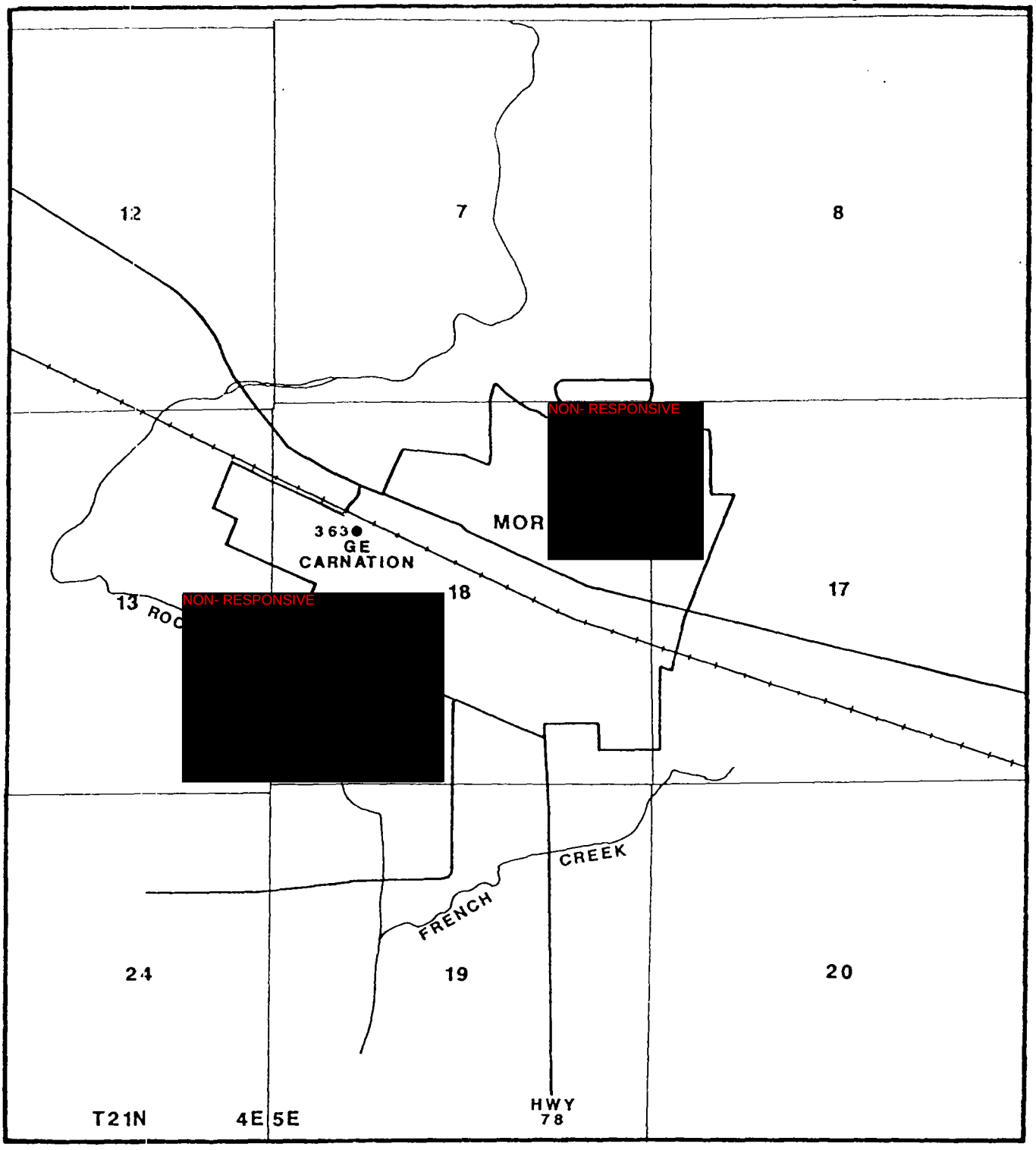
N

John Mathes & Associates, Inc.	
TOP OF BEDROCK (ELEVATIONS)	
12872832	FIGURE 5-4

0.011 feet per feet or 56 feet per mile was calculated across the site.

Regional information (Foster, 1956) suggests that the area in the vicinity of Morrison is part of the ancient drainage system of the Mississippi River and possibly Rock River. The current topography of the bedrock surface has probably been influenced by the major river systems, and the present drainage is a reflection of ancient alluvial or preglacial valleys that have incised the area. For this reason it may be very difficult to predict, without further studies, the topography of the bedrock surface at any location.

Changes in bedrock topography appear to occur in the area just north of Volkmans/Ethan Allen and the General Electric facility, and at City Well No. 3. During drilling operations behind Volkmans/Ethan Allen and the GE facility, Mathes did not encounter bedrock after drilling to an elevation of 581 feet AMSL at borehole location G105S. However, bedrock was encountered in the 1954 Test Borehole No. 4, which apparently was drilled in the immediate vicinity of G105S, at an approximate elevation of 587 feet AMSL (Figure 5-5.) The elevation for the 1954 Test Borehole No. 4 is approximate because it was taken from the Morrison topographic map and not surveyed. Another apparent change in the bedrock surface is in the vicinity of the city well field. Bedrock was encountered in G101D and in City Well No. 1 at elevations of 608 and approximately 610 feet AMSL, respectively, but was encountered at approximately 551 feet AMSL in City Well No. 3 (less than



EXPLANATION

G101D ● GROUNDWATER MONITORING WELL

CW3 ● CITY WELL

387 TOP OF SHALE ELEVATIONS

ELEVATIONS ARE IN FEET ABOVE MEAN SEA LEVEL

0 2000 4000
SCALE IN FEET

N

John Mathes & Associates, Inc.	
TOP OF SHALE (ELEVATIONS)	
12872832	FIGURE 5-5

300 feet away). These fluctuations in elevation indicate the extreme variability of the bedrock surface.

The Niagaran-Alexandrian dolomite is underlain by Ordovician-age Maquoketa shale at elevations ranging from 347 to 400 feet AMSL. Figure 5-5 presents the elevations of the top of the Maquoketa shale formation at those locations in and around the city where data is available. The information suggests that the surface of the shale unit is sloping to the northeast. Using approximate information from City Well No. 4 (in the northern portion of the site) and from City Well No. 1 (in the southern portion of the site), the slope of the Maquoketa shale surface beneath the City of Morrison is approximately 0.013 (67 feet per mile). Information reported by Foster (1956) indicates that the Maquoketa shale is dipping southwest at 15 feet per mile on a regional basis, suggesting that the surface of the shale unit at Morrison may represent a local disconformity or a nonconformable erosional surface.

The Maquoketa shale is considered a confining unit, separating the dolomite units above from the dolomite units (Galena-Platteville Formation) below. Information from the city wells indicate the average thickness of the Maquoketa shale in the vicinity of Morrison is about 200 feet. The shale is bluish-gray in color, although in some zones it is reported to be greenish-gray. The Maquoketa formation contains weak zones of shale that are subject to swelling, as well as dense sublithographic zones that are tight and competent. Records from the city wells also report the formation to contain thin

zones of fine to very fine dolmite and dolomitic shale. Both calcareous and non-calcareous shales were reported to be present.

5.2 Groundwater hydrology

The hydrologic units described in this section are based on a very limited data base. Much of the information gathered to date, however, appears to be consistent with the conceptual model of the regional hydrology.

The hydrologic units beneath the City of Morrison include a shallow, unconfined aquifer and a deep aquifer. The shallow aquifer includes sands and gravels overlying Niagaran-Alexandrian dolomite in the southern portion of the site, and this aquifer is present in at least the Niagaran-Alexandrian dolomite in the northern portion of the site. It is not known whether this aquifer (or other aquifers) are present in the surficial soils (glacial drift) overlying this dolomite formation in the northern portion on the site. A deep aquifer is present in the Ordovician and Cambrian rocks below the confining Maquoketa shale unit. The hydraulic characteristics of this aquifer are not known.

Hydrogeologic Cross Sections A-A' (Figure 5-3) and B-B' (Figure 5-4) illustrate the relationships between groundwater levels and the associated geologic units. Also presented on these cross sections are the groundwater levels measured in the

early 1950's in the city wells. The groundwater levels observed in the early 1950's indicate aquifer conditions in the city wells were under confined, artesian conditions at that time. Table 5-2 presents groundwater level data collected on June 30 through July 3, 1987, from the present monitoring well network and lists the geologic unit monitored by each well.

Based on the information obtained from the monitoring well network and presented in Figure 5-2, there does not appear to be a perched water table in the surficial sand and gravel deposits separate from the shallow unconfined aquifer in the Niagaran-Alexandrian dolomite in the southern portion of the site. An analysis of water level elevation data indicates a strong degree of hydraulic connection probably exists between the sand and gravel units and the underlying Niagaran-Alexandrian dolomite formation. No confining layer was identified as separating the sand and gravel from the bedrock units. Recharge to this shallow aquifer is from direct rainfall infiltration, the areal extent of which is unknown, but is believed to be present over the entire site.

Information is currently insufficient to identify whether a perched water table is present to any extent in the northern portion of the site, where the less permeable silts and clays occur. Groundwater was not encountered during the groundwater sampling event at location G103S, which is screened in the glacial drift (loess and till units). However, groundwater was encountered in the loess at this location during drilling at a depth of 20 feet below ground surface.

Table 5-2

GROUNDWATER DATA*

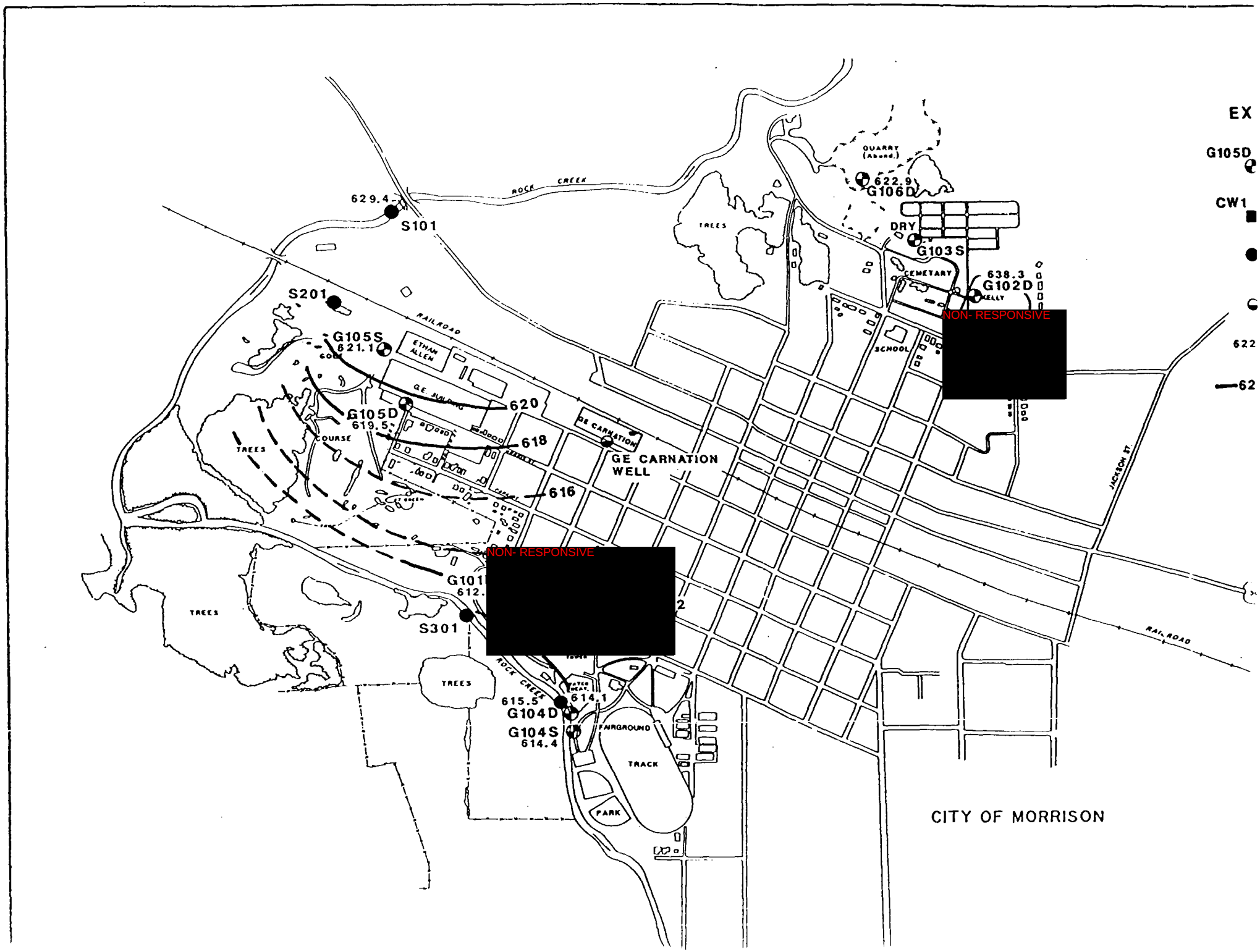
CITY OF MORRISON, ILLINOIS
JUNE 30 - JULY 3, 1987

Groundwater Monitoring Well	Groundwater Levels** Depth Below Land Surface	Elevation***	Screened Interval Geologic Unit
G101D	11.3	612.6	Lower Niagaran dolomite
G102D	73.3	638.3	Upper Niagaran dolomite
G103S	DRY	DRY	Loess
G104S	9.8	614.4	Sand and gravel
G104D	9.1	615.5	Upper Niagaran dolomite
G105S	13.1	621.1	Sand and gravel
G105D	22.6	619.5	Upper Niagaran dolomite
G106D	9.4	622.9	Upper Niagaran dolomite

* Data in feet below ground surface.
** Groundwater levels were measured prior to sampling the wells.
*** Elevations are in feet above mean sea level (AMSL).

The configuration of the groundwater surface for the shallow unconfined aquifer in the southern portion of the site is shown on Figure 5-6. The groundwater surface appears to have a fairly constant gradient to the southeast of 0.003 feet per feet or 16 feet per mile. The actual direction of flow, however, is believed to be towards the creek. Because information is limited in the northern portion of the site, the actual configuration of the groundwater surface across the entire site could be not estimated.

Accurate groundwater flow velocities could not be calculated from the limited amount of information collected during the investigation. However, observations were made during the drilling and well development activities that allow assumptions to be made concerning the hydraulic properties of the aquifer. Observations during drilling indicated that large volumes of water were accumulating as the boreholes were advanced, and rapid recharge occurred during well development. Based on these field observations and groundwater parameters obtained from Freeze & Cherry (1979), a value of 0.15 is assumed as the effective porosity and values of 0.28 to 2.8 feet per day are assumed for the hydraulic conductivity. Using these values and a groundwater gradient of 0.0031, the groundwater velocity is believed to be in the range of 2.1 to 21.3 feet per year.


ROCK CREEK
629.4
S101
S201
RAILROAD
G105S
621.1
ETHAN ALLEN
G105D
619.5
620
618
616
GE CARNATION
GE CARNATION WELL
TREES
COURSE
NON- RESPONSIVE
G101
612.
S301
TREES
TREES
ROCK CREEK
615.5
G104D
614.1
G104S
614.4
FAIRGROUND
TRACK
PARK
QUARRY (Abond.)
622.9
G106D
TREES
DRY
G103S
CEMETARY
638.3
G102D
WELLY
NON- RESPONSIVE
SCHOOL
JACKSON ST.
RAILROAD
CITY OF MORRISON
EX
G105D
CW1
622
62

6 GROUNDWATER QUALITY

Groundwater samples were collected from eight monitoring wells installed by Mathes, from the GE Carnation well, and from the City Well Nos. 1, 3, and 4 between June 30 and July 3, 1987. The samples were analyzed by Gulf Coast. The groundwater samples collected from the eight Mathes-installed monitoring wells were analyzed for USEPA Hazardous Substances List compounds (HSL). The groundwater samples collected from the city wells and from the GE Carnation well were analyzed for HSL volatile organic compounds only. In addition, a National Bureau of Standards (NBS) library search was performed to identify any other volatile compounds. Groundwater samples from discrete vertical intervals were collected from monitoring well G101D and analyzed for volatile organic priority pollutant compounds in an attempt to identify the most impacted vertical zone.

6.1 Discrete-interval groundwater samples

A total of five volatile organic compounds, TCE, 1,1,1-trichloroethane (1,1,1-TCA), methylene chloride, toluene, and acetone, were detected in the discrete-interval groundwater samples collected from monitoring well G101D. The results of this sampling event are presented in Table 6-1. One of the compounds detected, acetone, was also detected in the trip

Table 6-1

DISCRETE-INTERVAL GROUNDWATER SAMPLING RESULTS
VOLATILE ORGANIC COMPOUNDS

CITY OF MORRISON, ILLINOIS
JUNE 20-21, 1987

Sample Number	Depth (ft.)	Relative Vapor Conc. (NDU)	Compound	Concentration (ug/L) Measured	Detection Limit
G101D-1	234-211	3	Methylene chloride	42	5
			Acetone	17 B	10
			TCE	140	5
			Toluene	4 J	5
G101D-2	213-190	1.5	Acetone	11 B	10
			TCE	110	5
			Toluene	2 J	5
G101D-3	193-170	0	Acetone	15 B	10
			TCE	53	5
G101D-4	153-130	0	Acetone	12 B	10
			1,1,1-TCA	5	5
			TCE	55	5
G101D-5	113- 90	0	Acetone	13 B	10
			TCE	70	5
G101D-6	53- 30	0	Acetone	3 JB	10
			TCE	36	5
Trip Blank	--	--	Acetone	8 JB	10

NDU = needle deflection units measured with HNU.
B = Compound was also found in the blank.
J = Estimated value, below detection limits.
TCE = Trichloroethene
1,1,1-TCA = 1,1,1-Trichloroethane
NOTE: Only compounds detected in the samples are listed.

Source: Mathes, 1987.

blank and is therefore considered a laboratory contaminant. The other four detected compounds range in concentration from 5 ug/L to 140 ug/L.

Methylene chloride and 1,1,1-TCA were each found in only one sample during the discrete-interval sampling event. Methylene chloride was detected at a concentration of 42 ug/L from the interval between 211-234 feet. The compound 1,1,1-TCA was detected in the interval between 130-153 feet at a concentration of 5 ug/L. Toluene was tentatively identified in two of the samples at concentrations of 2 and 4 ug/L in the intervals from 190-213 and 211-234 feet, respectively.

TCE was detected in all samples collected during the discrete-interval sampling event. In general, the concentrations of TCE increased with depth. The greatest concentrations (110 and 140 ug/L) were measured in the samples collected from 190-213 and 211-234 feet, respectively.

6.2 Composite groundwater samples

Analytical results for the composite groundwater samples are reported separately in the following sections for volatile organic compounds, semi-volatile organic compounds, and inorganic compounds.

6.2.1 Volatile organic compounds

Table 6-2 is a list of the volatile organic compounds detected in the groundwater samples collected from Mathes wells, the GE Carnation well, and City Well Nos. 1, 3, and 4. A total of ten different compounds were identified. Both acetone and methylene chloride were identified in the bailer blank and in one of the two trip blanks. These two compounds are considered laboratory contaminants.

All of the eight remaining compounds were detected in the sample from monitoring well G105D, which is located on the southwest side of the General Electric facility. (Some of these compounds were detected at other locations also.) The duplicate sample from G105D contained three of these eight compounds, in similar concentrations. The compounds found in the greatest concentrations include TCE and 1,1,1-TCA. TCE concentrations of 14,000 and 16,000 ug/L were reported. Concentrations of 14,000 and 17,000 ug/L 1,1,1-TCA were detected in the sample and duplicate sample from G105D, respectively. Concentrations of 1,800 and 2,200 ug/L 1,1-dichloroethene were also measured in the sample and duplicate sample from G105D, respectively. Volatile organic compounds were not found in the sample from the shallow monitoring well G105S, which is located on the southwest end of the Volkmans/Ethan Allen facility.

TCE was also detected in the samples from monitoring well G101D and from City Well Nos. 1 and 3. Concentrations range

Table 6-2

COMPOSITE GROUNDWATER SAMPLING RESULTS
VOLATILE ORGANIC COMPOUNDS

CITY OF MORRISON, ILLINOIS
JUNE 29-30, 1987

Sample Number	Compound	Concentration (ug/L) Measured	Detection Limit
G101D	Acetone	7 J	10
	TCE	52 B	5
G102D	Acetone	5 JB	10
G104S	(None)	BDL	-
G104D	(None)	BDL	-
G105S	Acetone	5 JB	10
	Methylene chloride	3 J	5
G105D	Acetone	18 B	10
	Methylene chloride	26	5
	1,1-Dichloroethane	12	5
	1,2-Dichloroethane	16	5
	1,1-Dichloroethene	1,800 D	500
	1,2-Dichloroethene	57	5
	Chloroform	2 J	5
	1,1,1-TCA	14,000 D	500
	TCE	14,000 D	500
	Tetrachloroethene	9	5
G105D (Duplicate)	Acetone	500 JB	1000
	Methylene chloride	200 J	500
	1,1-Dichloroethene	2,200	500
	TCE	16,000	500
	1,1,1-TCA	17,000	500
G106D	(None)	BDL	-
GE Well	Acetone	100 B	10
	Methylene chloride	5	5
	1,1,1-TCA	40	5
	Tetrachloroethene	2 J	5
City Well No. 1	1,2-Dichloroethene	4 J	5
	TCE	620 D	50
	1,1,1-TCA	3 J	5
	Tetrachloroethene	2 J	5

B = Compound was also found in the blank.
J = Estimated value, below detection limits.
D = Compound was identified in an analysis at a secondary dilution factor.
BDL = Below detection limit.
TCE = Trichloroethene
1,1,1-TCA = 1,1,1-Trichloroethane
Note: Only compounds detected in the samples are listed.

Table 6-2, Continued

COMPOSITE GROUNDWATER SAMPLING RESULTS
VOLATILE ORGANIC COMPOUNDS

CITY OF MORRISON, ILLINOIS
JUNE 29-30, 1987

Sample Number	Compound	Concentration (ug/L) Measured	Detection Limit
City Well #3	1,2-Dichloroethene	6	5
	TCE	53	5
City Well #3 (Duplicate)	1,2-Dichloroethene	6	5
	TCE	56	5
City Well #4	(None)		
Bailer blank	Acetone	9 JB	10
	Methylene chloride	5 B	5
Trip Blank #1	Acetone	5 JB	10
	Methylene chloride	5 B	5
Trip Blank #2	(None)	BDL	-

B = Compound was also found in the blank.
J = Estimated value, below detection limits.
D = Compound was identified in an analysis at a secondary dilution factor.
BDL = Below detection limit.
TCE = Trichloroethene
1,1,1-TCA = 1,1,1-Trichloroethane
Note: Only compounds detected in the samples are listed.

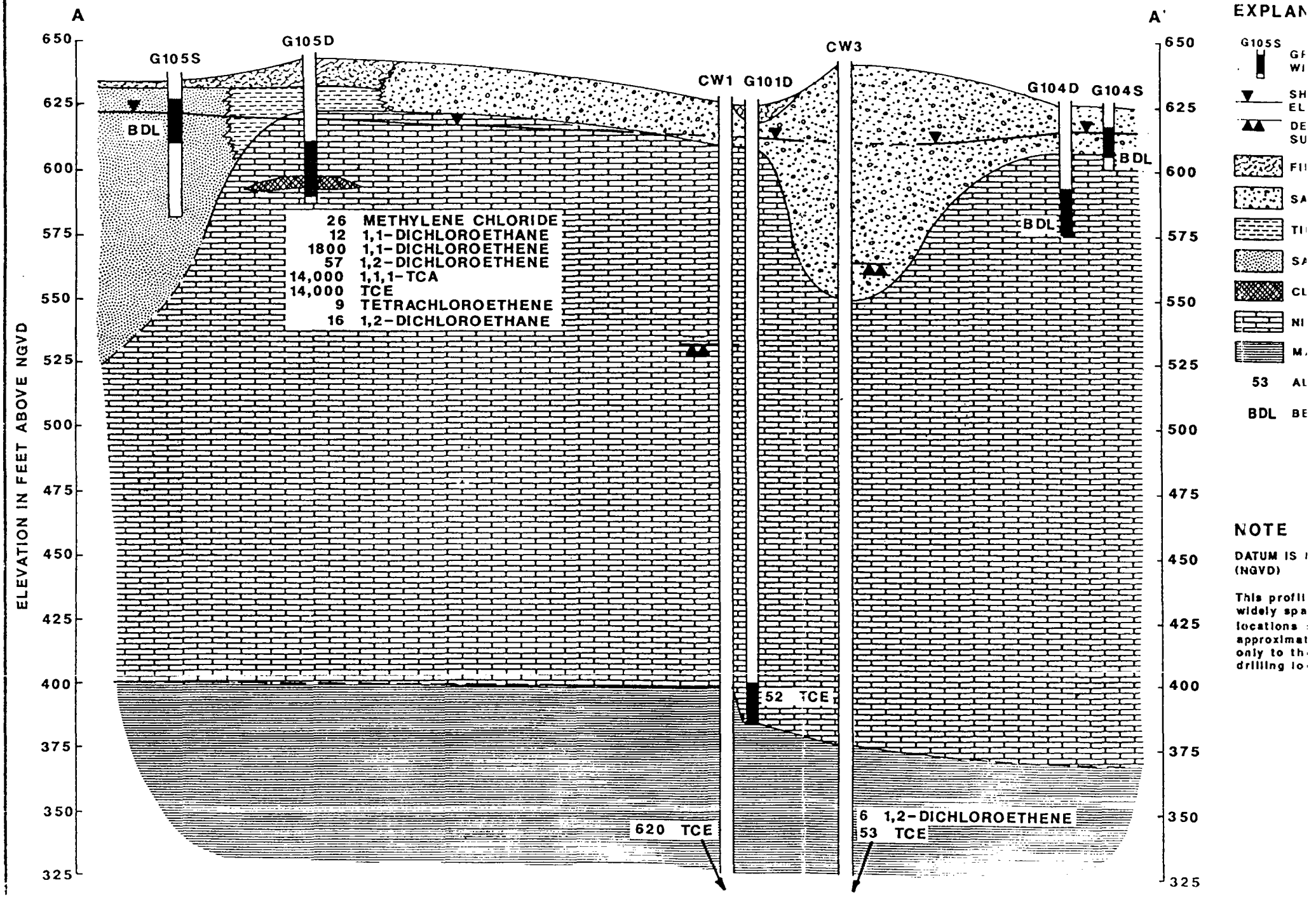
Source: Mathes, 1987.

from 620 ug/L in City Well No. 1 to 53 ug/L in City Well No. 3. A concentration of 52 ug/L TCE was reported in the sample from G101D.

Figure 6-1 presents Cross Section A-A' showing the relationship between screened intervals in the wells in the southern portion of the site and the concentrations detected. The highest concentrations of volatile organic compounds were detected in the monitoring well located on the southwest end of the GE facility (G105D), which is screened at a depth of 32.2 to 48.1 feet. Concentrations of TCE and related compounds are also present in the City Well Nos. 1 and 3, and in the GE Carnation well. These wells are screened at much deeper depths than the Mathes wells, indicating the volatile organic compounds may be migrating vertically downward into the bedrock. Volatile organic compounds were not detected in any of the shallow monitoring wells, suggesting that the shallow unconsolidated deposits may not be significantly impacted.

6.2.2 Semi-volatile organic compounds

Table 6-3 is a list of the results of the semi-volatile organic analyses performed on the samples obtained from the Mathes monitoring wells. Two compounds were tentatively identified: bis (2-ethylhexyl) phthalate and 2-cyclohexen-1-one. Both of these compounds were detected at concentrations below the actual detection limits for the analytical method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12 1,1-DICHLOROETHANE
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57 1,2-DICHLOROETHENE
14,000 1,1,1-TCA
14,000 TCE
9 TETRACHLOROETHENE
16 1,2-DICHLOROETHANE
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Table 6-3

COMPOSITE GROUNDWATER SAMPLING RESULTS
SEMI-VOLATILE ORGANIC COMPOUNDS

CITY OF MORRISON, ILLINOIS
JUNE 29-30, 1987

Sample Number	Compound	Concentration (ug/L) Measured	Detection Limit
G101D	Unknown	6.7 J	
	Unknown	58 JB	
	Unknown	14 JB	
	Unknown	9.6 JB	
G102D	bis(2-Ethylhexyl) phthalate	2.0 J	10
	Unknown	27 JB	
G104S*	bis(2-Ethylhexyl) phthalate	1.3 J	10
	Unknown	5.3 J	
	Unknown	23 J	
	Unknown	4.9	
	Unknown	13 JB	
	Unknown	10 J	
G104D	2-Cyclohexen-1-one	5.4 JB	
	Unknown	8.2 JB	
	Unknown	14 JB	
G105S	bis(2-Ethylhexyl) phthalate	1.2 J	10
	Unknown	6.9 J	
	Unknown	57 J	
	Unknown	30 JB	
	Unknown	5.7 J	
G105D	bis(2-Ethylhexyl) phthalate	1.0 J	10
	Unknown	23 JB	
	Unknown	8.5 J	
G105D (Duplicate)	bis(2-Ethylhexyl) phthalate	1.3 J	10
	Unknown	39 JB	
	Unknown	9.4 J	
G106D	bis(2-Ethylhexyl) phthalate	2.4 J	10
	Unknown	5.9 J	
	Unknown	4.8 JB	
	Unknown	25 JB	
	Unknown	5.7 JB	

B = Compound was also found in the blank.
J = Estimated value, below detection limits.
* = Results reported are those for re-extracted sample.
Note: Only compounds detected in the samples are listed.

Source: Mathes, 1987.

and, therefore, are reported as tentatively identified compounds. These compounds are commonly identified as laboratory contaminants.

6.2.3 Inorganic compounds

The results of the inorganic analyses performed by Gulf Coast using USEPA Method 6010 on the groundwater samples collected from the Mathes wells are presented in Table 6-4. Only dissolved inorganic compounds are reported by Mathes and discussed. Also included in this table are the Primary Drinking Water Standards and State of Illinois Standards for the detected compounds.

No federal standards for inorganic compounds were exceeded in any of the sample analyses. State of Illinois standards for iron, manganese, silver, and copper were exceeded in samples from certain locations.

The State standards for iron (1.0 mg/L) and manganese (0.15 mg/L) were exceeded in samples from locations G104S (16.9 mg/L iron, 1.78 mg/L manganese), G105S (22.0 mg/L iron, 3.41 mg/L manganese), and G106D (21.1 mg/L iron, 0.911 mg/L manganese). The State standard for silver (0.005 mg/L) was exceeded in the sample from location G104D (0.029 mg/L). The State standard for copper (0.02 mg/L) was exceeded in the sample from location G105S (0.032 mg/L).

Table 6-4

COMPOSITE GROUNDWATER SAMPLING RESULTS
INORGANIC COMPOUNDS

CITY OF MORRISON, ILLINOIS
JUNE 29-JULY 3, 1987

Sample Number	Compound	Measured Concentration (mg/L)		Federal Drinking Water Standards* (mg/L)	Illinois Drinking Water Standards** (mg/L)
G101D	Antimony	0.050	R		
	Arsenic	0.004	R	0.05	
	Barium	0.033		1.0	
	Iron	0.158			1.0
	Lead	0.012		0.05	
	Manganese	0.021			0.15
	Nickel	0.020			1.0
	Selenium	0.006	R	0.01	
	Zinc	0.013			1.0
G102D	Aluminum	0.356			
	Barium	0.068		1.0	
	Iron	0.797			1.0
	Lead	0.034		0.05	
	Manganese	0.053			0.15
	Zinc	0.031			1.0
G104S	Aluminum	13.2			
	Arsenic	0.007	R	0.05	
	Barium	0.279		1.0	
	Iron	16.9			1.0
	Lead	0.024		0.05	
	Manganese	1.78			0.15
	Nickel	0.121			1.0
	Vanadium	0.011			
	Zinc	0.094			1.0
G104D	Barium	0.051		1.0	
	Iron	0.346			1.0
	Lead	0.014		0.05	
	Manganese	0.067			0.15
	Silver	0.029		0.05	0.005
	Zinc	0.021			1.0
G105S	Aluminum	12.3			
	Arsenic	0.007	R	0.05	
	Barium	0.221		1.0	
	Chromium	0.015		0.05	
	Cobalt	0.020			
	Copper	0.032			0.02
	Iron	22.0			1.0
	Lead	0.028	E	0.05	
	Manganese	3.41			0.15
	Nickel	0.031			1.0
	Vanadium	0.025			
	Zinc	0.124			1.0

* = Primary Drinking Water Standards.
** = Standards shown are from Illinois Administrative Code, Title 35, Subtitle C, Chapter 1, Part 301 (General Water Use and Public Water Supply). Standards are shown only where a federal standard does not exist or is higher.
R = Spike recovery was not within control limits.
E = Concentrations exceed calibration range of the instrument for this specific analysis.
Note: Only dissolved inorganic compounds detected in the samples are listed.

Table 6-4, Continued

COMPOSITE GROUNDWATER SAMPLING RESULTS
INORGANIC COMPOUNDS

CITY OF MORRISON, ILLINOIS
JUNE 29-JULY 3, 1987

Sample Number	Compound	Measured Concentration (mg/L)		Federal Drinking Water Standards* (mg/L)	Illinois Drinking Water Standards** (mg/L)
G105D	Barium	0.060		1.0	
	Chromium	0.012		0.05	
	Iron	0.122			1.0
	Lead	0.008		0.05	
	Manganese	0.032			0.15
G105D (Duplicate)	Aluminum	0.091			
	Barium	0.060		1.0	
	Chromium	0.026		0.05	
	Iron	0.226			1.0
	Lead	0.004		0.05	
	Manganese	0.057			0.15
	Zinc	0.012			1.0
G106D	Aluminum	8.71			
	Arsenic	0.013	R	0.05	
	Barium	0.142		1.0	
	Cadmium	0.003		0.01	
	Copper	0.045			
	Iron	21.1			1.0
	Lead	0.020		0.05	
	Manganese	0.911			0.15
	Nickel	0.051			1.0
	Vanadium	0.018			
	Zinc	0.055			1.0

* = Primary Drinking Water Standards.
** = Standards shown are from Illinois Administrative Code, Title 35, Subtitle C, Chapter 1, Part 301 (General Water Use and Public Water Supply). Standards are shown only where a federal standard does not exist or is higher.
R = Spike recovery was not within control limits.
E = Concentrations exceed calibration range of the instrument for this specific analysis.
Note: Only dissolved inorganic compounds detected in the samples are listed.

7 SURFACE WATER QUALITY

Surface water and sediment samples were collected from Rock Creek and from the pond behind Volkmans/Ethan Allen during the sampling event on June 29-30, 1987. Three samples were collected from Rock Creek and one from the pond behind Volkmans/Ethan Allen. The samples were analyzed for HSL volatile organic compounds only and were analyzed using Method 624.

7.1 Surface water sampling results

Each compound identified in the samples was either identified at concentrations lower than the detection limit or was detected in the blank. 1,1,1-TCA (3 ug/L) was identified in the pond water sample collected from behind Volkmans/Ethan Allen. The results of the surface water samples are presented in Table 7-1.

7.2 Surface sediment sampling results

The results of the analyses performed on the sediment samples are presented in Table 7-2. Three volatile organic compounds were identified in the sediment samples: methylene

Table 7-1

SURFACE WATER SAMPLING RESULTS
VOLATILE ORGANIC COMPOUNDS

CITY OF MORRISON, ILLINOIS
JUNE 29-30, 1987

Sample Number	Compound	Concentration (ug/L) Measured	Detection Limit
S101	Methylene chloride	4 J	5
	Acetone	57 B	10
S201	Acetone	6 JB	10
	1,1,1-TCA	3 J	5
S301	Methylene chloride	3 J	5
S302	Acetone	3 JB	10
S302 (Duplicate)	None	BDL	--

B = Compound was also found in the blank.
J = Estimated value, below detection limits.
BDL = Below detection limit.
1,1,1-TCA = 1,1,1-Trichloroethane
NOTE: Only compounds detected in the samples are listed.

Source: Mathes, 1987

Table 7-2

SURFACE SEDIMENT SAMPLING RESULTS
VOLATILE ORGANIC COMPOUNDS

CITY OF MORRISON, ILLINOIS
JUNE 29-30, 1987

Sample Number	Compound	Units	Concentration Measured		Detection Limit
S101	Methylene chloride	ug/kg	21		5
	Acetone	ug/kg	31	B	10
	Total solids	percent	80.2		
S201	Methylene chloride	ug/kg	35		5
	Acetone	ug/kg	29	B	10
	2-Butanone	ug/kg	11		10
	Unknown	ug/kg	4	J	
	Unknown	ug/kg	18	J	
	Total solids	percent	79.8		
S301	Methylene chloride	ug/kg	18		5
	Acetone	ug/kg	40	B	10
	Total solids	percent	80.4		
S302	Methylene chloride	ug/kg	10		5
	Acetone	ug/kg	48	B	10
	Total solids	percent	75.7		
S302 (Duplicate)	Methylene chloride	ug/kg	4	J	5
	Acetone	ug/kg	27	B	10
	Total solids	percent	75.8		

B = Compound was also found in the blank.
J = Estimated value, below detection limits.
Note: Only compounds detected in the samples are listed.

Source: Mathes, 1987

chloride, acetone, and 2-butanone. Acetone was also detected in the blank and is considered a laboratory contaminant. The samples collected are identified as: S101, "up-gradient" of the site; S201, the pond sample; S301, "down-gradient" and adjacent to the city well field; and S302, "down-gradient" of the site.

Methylene chloride was the most consistently found compound in the sediment samples. Methylene chloride was detected in each of the samples at concentrations ranging from 4 ug/kg (at S302) to 35 ug/kg (at S201). The other compound identified, 2-butanone, was found at location S201 at a concentration of 11 ug/kg. Two unknown organic compounds were also detected at this location at estimated concentrations of 4 ug/kg and 18 ug/kg, respectively. Methylene chloride and 2-butanone are commonly identified as laboratory contaminants.

8 CONCLUSIONS

The following conclusions are based on the results of the Phase I investigation.

1. The hydrogeologic system present beneath the City of Morrison is not fully defined based on present data. In general, sands and gravels overlie the Silurian bedrock surface in the sourthwestern portion of the city, and finer-grained silts and clays overlie the Silurian bedrock in the northeastern part of the city. The Silurian bedrock surface appears to be highly irregular, but in general slopes towards the southwest.

2. An unconfined aquifer appears to be present across the site in the Niagaran-Alexandrian dolomite. A strong degree of hydraulic connection appears to be present between the sands and gravels and the Niagaran-Alexandrian dolomite in the southeastern portion of the city. A perched water table may be present in the lower permeability silts and clays in the northeastern portion of the city.

3. Evaluation of groundwater level data indicates that the general direction of groundwater flow is to the southeast. It is not known, on a more local scale, how Rock Creek influences groundwater movement. Accurate groundwater flow velocities could not be calculated due to a lack of data. Using estimated values of effective porosity and hydraulic conductivities, based on observations during drilling/well development operations, and the calculated groundwater gradient, flows velocities are believed to range from approximately 2 to 21 feet per year.

4. A soil gas investigation conducted by Tracer Research Corporation indicated a potential source area may be located in the vicinity of the northwest corner of the General Electric building. A possible plume of organic compounds trending southeast was identified from this location. The highest soil vapor concentrations detected were 5700 and 4800 ug/L of TCE at sampling locations having corresponding HNU readings of 500 and 100 needle deflection units, respectively.

5. A total of ten volatile organic compounds were detected in groundwater samples collected from the eight Mathes wells, from City Well Nos. 1, 3, and 4, and from the GE Carnation well. The greatest concentrations and number of compounds were detected in the sample from well G105D which is located on the southwest end of the General Electric building and screened in the shallow bedrock. The highest concentrations detected at this location (14,000 and 17,000

ug/L) were for the compounds trichloroethene (TCE) and 1,1,1-trichloroethane, respectively. Duplicate samples from this location indicate similar concentrations.

TCE was detected in City Well Nos. 1 and 3, in the GE Carnation well, and in Mathes wells G101D and G105D (and duplicate). This compound was not detected in any of the shallow wells, in the wells in the northeastern part of the city (G106D and City Well No. 4), or in the wells located adjacent to the Fairgrounds Landfill (G104S and G104D).

Results from the discrete interval sampling event (G101D) indicate that the greatest zone of impacted groundwater in the vicinity of the city well field (City Well Nos. 1, 2, and 3) is along the top of the Maquoketa shale.

There were no semi-volatile organic compounds positively identified in the Mathes-installed wells.

None of the groundwater samples collected from the Mathes-installed wells contained inorganic compounds that exceeded Primary Drinking Water standards. Some compounds exceeded standards promulgated by the State of Illinois.

6. Analytical results from the samples collected from Rock Creek did not indicate the presence of any volatile organic compounds. Methylene chloride was detected in all the sediment samples collected from Rock Creek. The surface water and sediment samples collected from the pond behind Volkmans/Ethan Allen did indicate the presence of volatile organic compounds. A concentration of 3 ug/L 1,1,1-TCA was identified in the water sample. Methylene chloride (35 ug/kg) was identified in the sediment sample. Also detected in the sediment sample were two unknown compounds (4 and 18 ug/kg) and 2-butanone (11 ug/kg). These compounds detected in the sediments may be laboratory artifacts.

7. Soil gas readings were also detected in the vicinity of the Fairgrounds Landfill. Although no volatile organic compounds were detected in the groundwater samples from the deep well installed at this location (G104D), organic compounds may potentially be present beneath this area, only at a depth lower than was monitored. Results from the discrete interval sampling (G101D) indicate that the greatest concentration of organic compounds in groundwater are on top of the Maquoketa shale. If the organic compounds have continued to migrate down-gradient from the city well field, they may also be present at this location above the Maquoketa shale.

8. Very little hydrogeological or chemical information has been accumulated around the city, with the exception of a

northwest-southeast trending transect between the Fairgrounds landfill and the Wetlands Area, and the northwest-southeast trending transect between City Well No. 4 and the quarry. Concentrations of volatile organic compounds (40 ug/L 1,1,1-TCA) were detected in a groundwater sample from the GE Carnation well. However, there is no information to indicate if another potential source area is present.

9. Groundwater impacted by volatile organic compounds does not appear to be present in the northern portion of the city, in the vicinity of the Presto landfill and City Well No. 4.

9 RECOMMENDATIONS

The following recommendations are based on the data and conclusions presented in this report. Remedial action alternatives are recommended to address the presence of organic compounds in the groundwater in City Well Nos. 1. and 3. Site investigation activities are also presented to more fully interpret hydrogeologic conditions, and to evaluate potential source area(s) and migration pathways. Additional hydrogeologic information is considered necessary to examine fluid transport rates and mechanisms.

9.1 Site investigations

1. A business inventory of manufacturing and/or industrial facilities that may have used TCE in the past in and around the City of Morrison should be conducted. The purpose is to identify other potential source areas of TCE.

2. A soil gas survey should be conducted to investigate any facilities identified during the business inventory that have a history of using TCE. If elevated soil gas values are obtained, soil samples should be collected at discrete intervals to a depth of 5-10 feet. The samples would be screened with air monitoring instruments and selected samples analyzed for volatile organic compounds.

3. A soil gas investigation should also be performed along the length of the north side of the General Electric facility, between General Electric and Volkmans/Ethan Allen. The survey should also extend along the length of the north side of the Volkmans/Ethan Allen facility, along the railroad easement, to evaluate potential spill areas. Figure 9-1 presents the approximate location proposed to be covered by the soil gas survey. Railroad sidings in the city should also be investigated as these areas are typically used for transfer of industrial liquids. By

investigating these areas, additional source(s) may be identified. As previously mentioned, if elevated soil gas values are recorded, soil samples should be taken at discrete intervals and analyzed for volatile organic compounds.

4. A seismic survey should be performed in the southern and western portion of the city. The purpose is to map bedrock topography and the top of the Maquoketa shale to provide three-dimensional correlation with geologic profiles. The seismic survey would identify low areas on the bedrock surface, which are potential migration pathways for the organic compounds. Figure 9-1 shows the recommended area of coverage by the seismic survey.

5. Two wells should be installed in the vicinity of City Well No. 1. The purpose of these wells is to evaluate the potential for TCE up-gradient of the city well field, and to test the confining nature of the Maquoketa shale. One well would be screened in the Maquoketa shale, with a seal above and below the screen, to monitor for the presence of organics in this unit. Information would also be gained about the hydraulic nature of the shale. Samples would be collected during drilling and scanned for the presence of fractures and zones of higher permeability. The second well would be placed in an up-gradient position from City Well No. 1 and screened just below the Maquoketa shale, in the deep aquifer. The purpose of this well is to determine if the volatile organics detected in the samples from monitoring well G105D are migrating through the Maquoketa shale and entering the deep aquifer from an up-gradient position. Soil/core and groundwater samples should be collected from these locations to gather geologic information. The proposed locations of these wells are shown in Figure 9-1.

6. Additional test boreholes around the city should be drilled and monitoring wells installed to obtain subsurface information. The approximate locations of these wells are presented on Figure 9-1. The results of the soil gas and seismic surveys could influence the specific locations of these wells. The wells would be used for geologic logging, soil and groundwater sampling, and aquifer testing. Some of the wells could also be constructed as recovery wells to control the movement of impacted groundwater in the vicinity of G105D.

   One well should be located in the vicinity of the Fairgrounds landfill and extend to the top of the Maquoketa shale. The purpose is to monitor groundwater on top of the Maquoketa shale. Another well should be located between the city well field and the General Electric facility and extended to the top of the Maquoketa shale. Discrete-

interval samples should be collected from this well to evaluate the movement of the potential organic plume from the area around G105D to the city well field.

Other wells should be located in areas where low points occur on the bedrock surface as identified during the seismic survey. These lowpoints would be good locations for recovery wells. In addition, a well should be installed adjacent to well G105D and continuously sampled to the top of the Maquoketa shale. This borehole would evaluate the vertical extent of organic compounds in this area. A well located on the south side of Rock Creek, in an east-west line with the city wells, should be installed to monitor groundwater movement and possibly the movement of organic compounds in this direction. The other wells placed around the city would also be used as piezometers to indicate groundwater flow directions in the shallow aquifer and the extent of migration of the organic compounds.

7. The size potential and extent of the source area located adjacent to the General Electric facility should be evaluated. This can be accomplished by drilling shallow test boreholes in a radial pattern around G105D and analyzing selected samples for volatile organic compounds. The samples to be analyzed would be chosen based on air quality instrument readings.

8. The locations of the storm and sanitary sewer network around the city should be investigated. It is possible that these are acting as migration pathways or conduits for organic compounds. (The City of Morrison water treatment plant is located down-gradient of the city well field and the potential source area at G105D).

9.2 Remedial action alternatives

The following remedial actions are proposed assuming that the investigations from Section 9.1 are conducted.

The first remedial action is proposed assuming that volatile organic compounds are present only in the shallow bedrock and surficial aquifer and not in the deep aquifer beneath the Maquoketa shale. This can be tested by

installing a well screened beneath the Maquoketa shale, up-gradient from the city well field as proposed above in Recommendation No. 5.

The second remedial action proposed is based on information obtained from the seismic survey proposed in Recommendation No. 4. The seismic survey would identify low areas on the bedrock surface that may be potential collection areas for TCE and associated compounds.

The following is a list of remedial actions recommended to address the organic compounds detected in City Well Nos. 1 and 3 in the City of Morrison.

1. Recomplete City Well Nos. 1 and 3 into the Maquoketa shale with a smaller diameter casing to seal off the Niagaran-Alexandrian dolomite from the underlying hydrologic units. This can be accomplished by setting a drillable plug in the casing at a depth just below the bottom of the Maquoketa shale. A packer is then placed at the base of the hole; the casing is set and the hole is then pressure grouted to the surface.

   The purpose of this remedial action is to seal the city water supply wells from the upper aquifer, which is considered to be hosting the organic compounds. The organics are believed to be traveling down the existing well casings and impacting the deeper aquifer. By properly casing off the upper material, the organic compounds will be sealed in the upper aquifer and prevented from impacting the city water supply.

2. Recovery wells should be installed in the vicinity of G105D to intercept the migration of volatile organic compounds. The area around G105D has been identified as a potential source for the organic compounds found in City Well Nos. 1 and 3. Because the extent of the source area has not been determined, recovery wells can be used to control the migration of organic compounds away from this area until further investigations can be implemented to evaluate the nature and extent of the source area.

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USGS, 1985, Morrison quadrangle, 7 1/2 minute topographic map.

APPENDIX A

TRACER RESEARCH CORPORATION SOIL GAS REPORT

Tracer Research Corporation

3655 North Business Center Drive Tucson, Arizona 85705 (602) 888-9400

SOIL GAS INVESTIGATION
FOR
CITY OF MORRISON
MORRISON, ILLINOIS

MAY 1987

Prepared For:

John Mathes & Associates, Inc.
210 West Sand Bank Road
P.O. Box 330
Columbia, Illinois 62236-0330

Submitted By:

Tracer Research Corporation

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INTRODUCTION

Tracer Research Corporation (TRC) performed a soil gas investigation from May 2 to May 8, 1987 in the city of Morrison located in Whiteside County, Illinois. The investigation was performed under contract to John Mathes & Associates.

A total of 60 soil gas samples were collected and analyzed to determine the source and extent of subsurface contamination. Soil gas samples were collected at depths ranging from 2 to 5 feet and were analyzed for the following halocarbon compounds:

1,1,1-Trichlorotrifluoroethane (F-113)
1,1,1-Trichloroethane (TCA)
Trichloroethene (TCE)
Tetrachloroethene (PCE)

Soil gas normally contains background levels of halocarbon contamination which are mainly a function of ambient air concentrations of volatile organic compounds (VOC's). When interpreting the results from a soil gas investigation, background contamination needs to be distinguished from levels of contamination that may be significant in terms of soil or groundwater contamination. The level of significance is both compound and site specific, and is established by considering the concentration of the contaminant in the ambient air, the concentration in the soil gas in areas believed or known to be clean, and TRC's previous experience under similar conditions.

At this investigation site, the following concentrations of halocarbons were interpreted as being significant:

TCE - 0.01 ug/L
TCA - 0.01 ug/L
PCE - 0.01 ug/L
F-113 - 0.1 ug/L

These levels of significance indicate areas which may be underlain by groundwater or soil contamination.

BACKGROUND ON THE METHODOLOGY

The presence of volatile organic chemicals (VOCs) in shallow soil gas indicates the observed compounds may either be in the vadose zone near the probe or in groundwater below the probe. The soil gas technology is most effective in mapping low molecular weight halogenated solvent chemicals and petroleum hydrocarbons possessing high vapor pressures and low aqueous solubilities. These compounds readily partition out of the groundwater and into the soil gas as a result of their high gas/liquid partitioning coefficients. Once in the soil gas, VOCs diffuse vertically and horizontally through the soil to the ground surface where they dissipate into the atmosphere. The contamination acts as a source and the above ground atmosphere acts as a sink, and typically a concentration gradient develops between the two. The concentration gradient in soil gas between the source and ground surface may be locally distorted by hydrologic and geologic anomalies (e.g. clays, perched water); however, soil gas mapping generally remains effective because distribution of the contamination is usually broader in areal extent than the local geologic barriers and is defined using a large data base. The presence of geologic obstructions on a small scale tends to create aromalies in the soil gas-groundwater correlation, but generally does not obscure the broader areal picture of the contaminant distribution.

SAMPLING AND ANALYTIC PROCEDURES

Tracer Research Corporation utilized an analytical field van which was equipped with two gas chromatographs and two Spectra Physics SP4270 computing integrators. In addition, the van has two built-in gasoline powered generators which provide the electrical power (110 volts AC) to operate all of the gas chromatographic instruments and field equipment. A specialized hydraulic mechanism consisting of two cylinders and a set of jaws was used to drive and withdraw the sampling probes. Probes consist of 7-foot lengths of 3/4 inch diameter steel pipe which are fitted with detachable drive points. A hydraulic hammer was used to assist in driving probes past cobbles and through unusually hard soil.

Soil gas samples were collected by driving a hollow steel probe to a depth between 2 feet and 5 feet into the ground. The above-ground end of the sampling probes was fitted with a steel reducer and a length of polyethylene tubing leading to a vacuum pump. Five to 10 liters of soil gas was evacuated from the formation with a vacuum pump. During the soil gas evacuation, samples were collected by inserting a syringe needle through a silicone rubber segment in the evacuation line and down into the steel probe. Ten milliliters of gas were collected for immediate analysis in the TRC analytical field van. Soil gas was subsampled (duplicate injections) in volumes ranging from 1 ul to 2 ml, depending on the VOC concentration at any particular location.

A gas chromatograph equipped with an electron capture detector was used for analyses of F-113, TCA, TCE and PCE. Nitrogen was used as the carrier gas.

LIMITS OF DETECTION

Detection limits are a function of the injection volume as well as the detector sensitivity for individual compounds. Thus, the detection limit varies with the sample size. Generally, the larger the injection size the greater the sensitivity. However, peaks for compounds of interest must be kept within the linear range of the detector. If any compound has a high concentration, it is necessary to use small injections, and in some cases to dilute the sample to keep it within linear range. This may cause decreased detection limits for other compounds in the analyses. The detection limits range down to 0.00005 ug/l for compounds such as TCA and PCE depending on the conditions of the measurement, in particular, the sample size. If any component being analyzed is not detected, the detection limit for that compound in that analysis is given as a "less than" value (e.g. <0.0001 ug/l). This number is calculated from the current response factor, the sample size, and the estimated minimum peak size (area) that would have been visible under the conditions of the measurement.

QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES

Tracer Research Corporation's normal quality assurance procedures were followed in order to prevent any cross-contamination of soil gas samples.

- Steel probes are used only once during the day and then washed with high pressure soap and hot water spray or steam-cleaned to eliminate the possibility of cross-contamination. Enough probes are carried on each van to avoid the need to reuse any during the day.

- Probe adaptors (steel reducer and tubing) are used once during the course of the day and cleaned at the end of each working day by baking in the GC oven. The tubing is replaced periodically as needed during the job to insure cleanliness and good fit.

- Silicone tubing (connecting the adaptor to the vacuum pump) is replaced as needed to insure proper sealing around the syringe needle. This tubing does not directly contact soil gas samples.

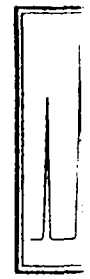
- Glass syringes are usually used for only one sample per day and are washed and baked out at night. If they must be used twice, they are purged with carrier gas (nitrogen) and baked out between probe samplings.

- Septa through which soil gas samples are injected into the chromatograph are replaced on a daily basis to prevent possible gas leaks from the chromatographic column.

- Analytical instruments are calibrated each day by the use of chemical standards prepared in water by serial dilution from commercially available pure chemicals. Calibration checks are also run after approximately every five soil gas sampling locations.

- 2 cc subsampling syringes are checked for contamination prior to sampling each day by injecting nitrogen carrier gas into the gas chromatograph.

- Prior to sampling each day, system blanks are run to check the sampling apparatus (probe, adaptor, 10 cc syringe) for contamination by drawing ambient air from above ground through the system and comparing the analysis to a concurrently sampled air analysis.



- All sampling and 2 cc subsampling syringes are decontaminated each day and no such equipment is reused before being decontaminated. Microliter size subsampling syringes are reused only after a nitrogen carrier gas blank is run to insure it is not contaminated by the previous sample.

- Soil gas pumping is monitored by a vacuum gauge to insure that an adequate gas flow from the vadose zone is mairtained. A negative pressure (vacuum) of 2 in. Hg less than the maximum capacity of the pump (evacuation rate >0.02 cfm) usually indicates that a reliable gas sample cannot be obtained because the soil has a very low air permeability.

RESULTS

A total of 60 soil gas samples were collected in the city of Morrison, Illinois. Analytical data from the investigation is summarized in Appendix A. Figure 1 is a map showing the soil gas sampling locations. Figures 2 through 5 are isoconcentration contour maps for TCE, TCA, PCE and F-113, respectively. Concentrations were contoured on an order of magnitude interval.

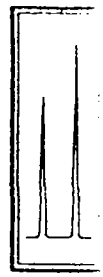
The primary objective of the investigation was to locate the source of contamination leading to elevated levels of VOC's detected in city wells #1, #2, and #3. This was accomplished by sampling in the vicinity of three potential sources: Wetlands Area, Presto Landfill and the Fairgrounds Landfill. In addition soil gas samples were collected in the vicinity of city wells #1, #2, #3 and #4. Soil gas samples were also collected south of the Wetlands Area.

The highest concentrations of VOC's in the soil gas samples were detected in the southern portion of the Wetlands Area. Of the quantified VOC's, TCE was detected in the highest concentrations, with the highest amount detected at sampling location SG-32 (5200 ug/L). Contamination decreased to the south from SG-32 but again increases at soil gas locations SG-42, SG-43 and SG-44. This suggests that a second source of contaminants may be present in the vicinity of these sampling locations.

Based on the plume geometry generated from the soil gas data, the contamination appears to be migrating towards the south/southeast. In the soil gas, TCE extends at least to SG-44 where 12 ug/L of TCE were detected. This, however, does not necessarily indicate the extent of underlying TCE groundwater contamination. It is possible that contamination in the groundwater extends as far south as the city wells at levels not reasonable to be detected in the soil gas. Also, a clay layer,

encountered approximately 4 feet beneath the ground surface, may restrict the vertical movement of VOC vapors from the contaminated groundwater to the surface. This would cause a decrease in the ratio of concentrations of VOC's in the soil gas to groundwater.

Significant levels of VOC's were detected in the vicinity of city wells #1, #2 and #3. These levels of contamination are likely related to contamination from the Wetlands Area although soil gas analysis could not confirm this, Soil gas samples collected in the vicinity of the Presto Landfill and city well #4 did not contain significant amounts of quantified VOC's.



CONCLUSIONS

The results from this investigation indicate sources of VOC contamination in the south portion of the Wetlands Area with the highest levels of contaminants detected at sampling locations SG-32 and SG-34. Contamination decreases south of these locations but then increases in the vicinity of SG-44. Contamination emanating from these areas extends south-southeast towards city wells #1, #2 and #3. The soil gas contaminant plume could not be traced from the wetlands area to the wells possibly because of the vapor restricting clay layer. A groundwater contamination plume may extend beyond that defined by soil gas at concentrations lower than can be detected above background in the soil gas. Significant VOC contamination in the soil gas was not detected in the vicinity of city well #4 and the Presto Landfill.

APPENDIX A: CONDENSED DATA

JOHN MATHES & ASSOCIATES-MORRISON, ILLINOIS

Sample	Depth	Date	F-113 (ug/l)	TCA (ug/l)	TCE (ug/l)	PCE (ug/l)
S601	5'	05/05	<0.0002	0.002	0.09	0.007
S602	5'	05/05	<0.0002	0.0006	0.006	0.003
S603	5'	05/05	0.0002	0.002	0.01	0.005
S604	5'	05/05	0.04	0.2	0.002	0.01
S605	5'	05/05	<0.0002	0.009	0.005	<0.00006
S606	5'	05/05	0.02	0.004	0.04	0.006
S607	5'	05/05	0.02	0.02	0.003	0.003
S608	5'	05/05	0.06	0.04	0.005	0.001
S609	5'	05/05	<0.0002	0.006	0.003	0.0009
S610	5'	05/05	0.04	0.08*	0.08	0.02
S611	5'	05/06	0.05	0.04	0.02	0.03
S612	5'	05/06	0.0002	0.01	0.002	0.002
S613	5'	05/06	0.03	0.02	0.01	0.003
S614	5'	05/06	0.03	0.003	0.002	0.008
S615	5'	05/06	<0.0002	0.003	0.003	0.002
S616	5'	05/06	0.1	0.2	1	0.009
S617	5'	05/06	0.0002	0.02	0.02	0.002
S618	5'	05/06	0.04	0.04	1	0.02
S619	5'	05/06	0.04	0.008	0.008	0.008
S620	5'	05/06	0.03	0.007	0.002	0.0002
S621	5'	05/06	0.01	0.008	0.008	0.0008
S622	5'	05/06	0.03	0.002	0.002	0.002
S623	5'	05/06	0.03	0.01	0.1	0.002
S624	5'	05/06	0.0002	0.005	0.008	0.0008
S625	5'	05/06	0.02	0.01	0.004	0.00006
S626	5'	05/06	0.1	0.006	0.009	0.001
S627	5'	05/06	0.008	0.1	0.4	0.01
S628	5'	05/06	0.02	1	1	0.008
S629	5'	05/06	0.01	12	2	0.003
S630	5'	05/06	0.02	2	1	0.2
S631	5'	05/06	0.005	0.4	0.01	0.0002
S632	5'	05/06	1	26	5,000	20
S633	5'	05/07	0.03	2	0.07	0.004
S634	5'	05/07	2	610	4,800	32
S635	5'	05/07	0.1	0.05	0.05	0.00005
S636	5'	05/07	0.1	2	0.05	0.002

Notations:
1 = [illegible] with adjacent peaks
ND = not detected

Analyzed by K. Tolman

Checked by J. Phillips

JOHN MATHES & ASSOCIATES-MORRISON, ILLINOIS

Sample	Depth	Date	F-113 (ug/l)	TCA (ug/l)	TCE (ug/l)	PCE (ug/l)
S637	5'	05/07	0.4	9	0.6	0.01
S638	4'	05/07	<0.0002	0.004	0.002	0.0003
S639	4'	05/07	<0.0002	0.002	0.002	0.002
S640	5'	05/07	<0.0002	0.0008	0.0009	0.0002
S641	5'	05/07	0.6	0.4	0.005	0.004
S642	5'	05/07	4	150	71	0.8
S643	5'	05/07	0.3	4	14	0.03
S644	5'	05/07	0.08	3	12	0.06
S645	5'	05/07	0.08	0.1	0.002	0.0006
S646	5'	05/07	0.2	0.2	0.0006	0.0008
S647	5'	05/07	0.4	0.4	0.06	0.4
S648	5'	05/07	0.06	0.03	0.0004	0.0004
S649	5'	05/07	0.1	0.02	0.003	0.0003
S650	4'	05/07	<0.9	0.3	640	<0.3
S651	5'	05/07	<0.09	11	12	0.9
S652	2'	05/08	0.02	0.006	0.002	0.00003
S653	2'	05/08	0.1	0.04	0.0004	0.0003
S654	2'	05/08	0.02	0.004	0.0007	0.0001
S655	2'	05/08	0.02	0.005	0.003	0.00003
S656	2'	05/08	0.01	0.001	0.0004	0.00005
S657	2'	05/08	0.01	0.003	0.0005	0.0002
S658	5'	05/08	0.02	0.004	0.0007	0.0002
S659	2'	05/08	0.02	0.002	0.006	0.0001
S660	3'	05/08	<0.0002	0.0004	0.0004	<0.00005

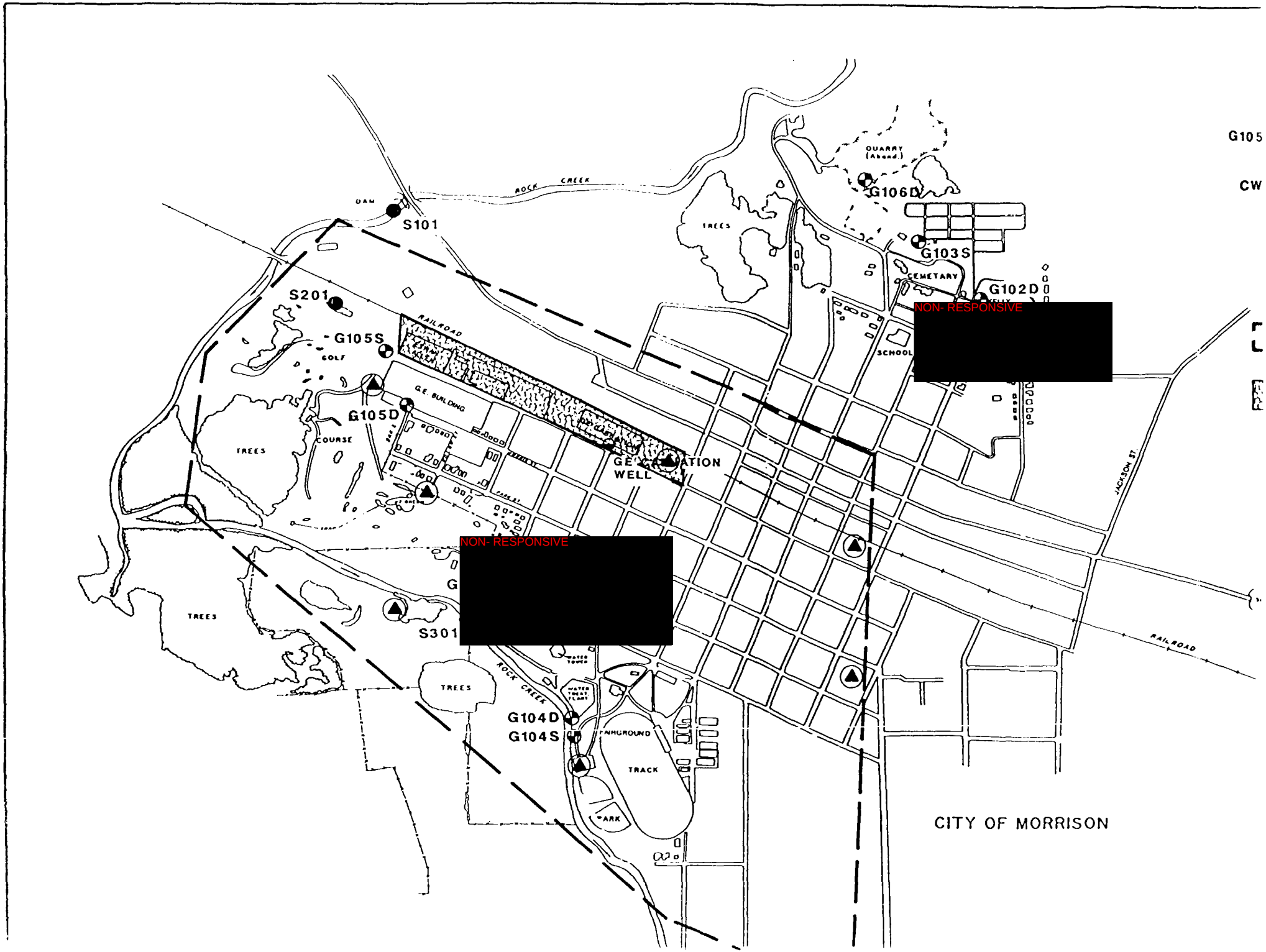
Notations:
I interference with adjacent peaks
NR not analyzed

Analyzed by K. Tolman

Checked by J. Phillips

APPENDIX B

GEOLOGIC LOGS


G105
CW
ROCK CREEK
DAM
S101
QUARRY (Abond.)
G106D
TREES
G103S
CEMETARY
G102D
S201
RAILROAD
G105S
GOLF
NON- RESPONSIVE
SCHOOL
G.E. BUILDING
G105D
COURSE
TREES
GE [illegible]ATION WELL
JACKSON ST.
NON- RESPONSIVE
G
S301
TREES
RAILROAD
ROCK CREEK
TREES
G104D
G104S
CAMPGROUND
TRACK
PARK
CITY OF MORRISON

GEOLOGIC LOG

SERIAL NO. GL_____
PAGE 1 OF 2

BORING NO. G105S
DATE/TIME STARTED 6-22-87/0820 PROJECT NO. 12872832
PROJECT NAME Morrison Phase 1 RI MAJOR TASK 2292 SUBTASK -
ELEV._____ DRILLING METHOD (S) Air Rotary
DRILLER Elders, L HELPER Elders, T
RIG MAKE/MODEL CME 74

DEPTH	SAMPLE NO.	SAMPLE INTERVAL	SAMPLE TYPE	RECOVERY	SAMPLE RETAINED JAR NO.	SAMPLE RETAINED JAR INTERVAL	SAMPLE LABEL SERIAL #	CLASSIFICATION SYSTEM: Unified SAMPLE DESCRIPTION	DEPTH OF CHANGE	QP (tsf)	N/6"	REMARK #
								0' Gravel; Dark Brown Silty	6"			
								SAND, Trace Gravel FILL				
								CONCRETE @ 3'	3'			
5								Dark Brown Silty Fine SAND,	3.5'			
								SM (Moist)				
10												
								SAA, Wet				1
												2
15												
20												
								Dark Brown Silty Fine SAND				3
								Trace Clay, SM; Wet				
												4
25												

WELL INSTALLED: YES X NO__
COMMENTS_____

GEOLOGIST SIGNATURE_____

DATE/TIME OF COMPLETIONS
BORING 6-22-87/1000
WELL INSTALLATION 6-22-87/1200
WELL PROTECTION 6-22-87/1200

JOHN MATHES & ASSOCIATES, INC.

GEOLOGIC DRILLING COMMENTS

BORING NO. G105S JMA PROJECT NO. 12872832 DATE 6-22-87

REMARK NO.	REMARKS
1	Encountered h_2O @ 11.0'
2	Driller indicating blowin on top of bit
3	Pulled rods out @ 20', hole collapsed to 8.0' started new hole 3.0' N
4	In new hole G105S installed 22' of 8" casing to hold hole open. Continued to advance hole
5	@ 53.0' still in silty sand (no rock) decision to install well; backfill to 23.0'. Pulled rods; hole collapsed to 23.0'

WATER LEVELS

REFERENCE POINT	DATE	TIME	DEPTH (FT.)	COMMENTS	TECH.
Ground Surface	6-22-87	0840	11.0	During Drilling	CM

WATER SAMPLING DATA

SERIAL NO. WS 00009
PAGE __ OF __

PROJECT NAME Morrison ph I RI
SAMPLE LOCATION NO. OR BORING/WELL NO. G104S
PROJECT NO. 12872832
MAJOR TASK 2294 SUBTASK —
TECHNICAL CREW C. Maxeiner / D Davenport
DATE JUN 20 87
FORM COMPLETED BY CM2/00

WEATHER Sunny
LEVEL OF PROTECTION A B C (D) *
MEASURING POINT Top of Riser
METHOD OF MEASUREMENT EWI
MEASURING POINT ELEV. ____
INITIAL WATER LEVEL ELEV. ____

SAMPLING METHOD Teflon Bailer
INITIAL WATER LEVEL 8'10-1/4" TOR
SPECIAL SAMPLING METHODS Teflon
TIME ELAPSED/FINAL DEVELOPMENT/PURGING 30 min
TECHNICIAN CM2/DD
SAMPLING DEPTH INTERVAL Full well
PUMPING RATE/SAMPLING —

WATER QUALITY INSTRUMENTS USED	SERIAL NO.	CALIBRATION REFERENCE
1. Orion 210 ph meter	2210	see Orion 210 ph meter Calibration logbook 14
2. YSI S-C-T meter	12411	see YSI S-C-T meter calibration log book 13
3. YSI Dissolved Oxygen meter	DD 12992	see YSI D.O. meter Calibration logbook 15
4.		
5.		

FINAL WATER QUALITY INSTRUMENT READINGS

TEMP (°C) 13.5
CONDUCTIVITY (umhos/cm) 82 x 10'
PH 6.98
EH 145
D.O. (mg/l) 4.59
OTHER ____

Filtered ~~DUPLICATE~~ DD WATER SAMPLING DATA INSTRUMENT READINGS

TEMP (°C) 13.5
CONDUCTIVITY (umhos/cm) 83 x 10'
PH ____
EH 139
D.O. (mg/l) 3.21

TECHNICIAN CM2 TIME START 1719 TIME FINISH 1742

SAMPLE COLLECTION PERIOD: START 1719 STOP 1742 TECHNICIAN CM2

*NOTE: FOR LEVELS OF PROTECTION; SEE SITE SPECIFIC SAFETY PLAN FOR DETAILS.

SERIAL NO. WS _____
PAGE __ OF __

TOTAL VOLUME WATER COLLECTED _____ TOTAL NO. OF CONTAINERS 7
FIELD FILTERED: YES ✓ NO __ TIME 1729 TECH. CM FILTER TYPE BARREL
SAMPLES COOLED DURING COLLECTION PERIOD: YES ✓ NO __

SAMPLE CONTAINERS

QUANTITY	CONTAINER MATERIAL	SAMPLE LABEL SERIAL NO.	PRESERVATIVES	COMMENTS
40 ML	GLASS	SL0000 20	—	VOA
40 ML	"	21	—	VOA
½ GAL	"	22	—	BNA
½ GAL	"	23	—	BNA
1 L.	PLASTIC	24	HNO3	METALS - TOTAL
1 L.	"	25	HNO3	METALS - DISS
10 ML	"	26	—	PREFILTRATION

DOCUMENTATION

SAMPLE CONTAINERS SEALED: YES __ NO ✓ TIME _____ TECHNICIAN _____
SAMPLE SHIPPING CONTAINER SEALED & PACKED: YES ✓ NO __ TIME 2300 TECH CM
LAB ANALYSIS REQUEST FORM: YES ✓ NO __ TIME 2200 SERIAL NO LAR 2665 TECH. CM
CHAIN OF CUSTODY FORM: YES ✓ NO __ TIME 2300 SERIAL NO. ~~2665~~ 2666 TECH. CM

COMMENTS: _____

GEOLOGIC LOG

SERIAL NO. GL_____
PAGE 1 OF 2

BORING NO. G102D
DATE/TIME STARTED 6-23-87/0730 PROJECT NO. 12872832
PROJECT NAME Morrison Phase 1 RI MAJOR TASK 2292 SUBTASK -
ELEV._____ DRILLING METHOD (S) Air Rotary

DRILLER Elders, L HELPER Elders, T
RIG MAKE/MODEL IR T4

DEPTH	SAMPLE NO.	SAMPLE INTERVAL	SAMPLE TYPE	RECOVERY	SAMPLE RETAINED JAR NO.	SAMPLE RETAINED JAR INTERVAL	SAMPLE LABEL SERIAL #	CLASSIFICATION SYSTEM: Unified SAMPLE DESCRIPTION	DEPTH OF CHANGE	QP (tsf)	N/6"	REMARK #
								0-6" Topsoil, Darker Red-Brown	6"			
								Clayey SILT Trace Sand, ML,				
								Loess, Dry				
10												
								(SAA)				
20								Gray-Brown @ 20' Moist	20'			1
30								Gray-Brown Clayey SILT Trace				
								Sand, LOESS, ML, Moist-Wet				
40												
								SAA				
50												2 3

WELL INSTALLED: YES X NO__
COMMENTS_____

GEOLOGIST SIGNATURE_____

DATE/TIME OF COMPLETIONS
BORING 6-23-87/1200
WELL INSTALLATION 6-23-87/1730
WELL PROTECTION 6-23-87/1730

JOHN MATHES & ASSOCIATES, INC.

GEOLOGIC DRILLING COMMENTS

BORING NO. G102D JMA PROJECT NO. 12872832 DATE 6-23-87

REMARK NO.	REMARKS
1	Encountered soil unit water @ 21.0'.
2	@ 50.0' pulled rods, hole collapsed to 22.0'; went in w/50' of 8" casing (not grouted).
4	Continued open hole drilling in silt, harder drilling.

WATER LEVELS

REFERENCE POINT	DATE	TIME	DEPTH (FT.)	COMMENTS	TECH.
Ground Surface	6-23-87	0815	21.0'	During Drilling	CM

GEOLOGIC LOG

SERIAL NO. GL_____
PAGE 1 OF 2

BORING NO. G101D
DATE/TIME STARTED 6-19-87/0600 PROJECT NO. 12872832
PROJECT NAME Morrison Rhase 1 RI MAJOR TASK 2292 SUBTASK -
ELEV. _____ DRILLING METHOD (S) Air Rotary

DRILLER Elders, L HELPER Elders, T
RIG MAKE/MODEL 14

DEPTH	SAMPLE NO.	SAMPLE INTERVAL	SAMPLE TYPE	RECOVERY	SAMPLE RETAINED JAR NO.	SAMPLE RETAINED JAR INTERVAL	SAMPLE LABEL SERIAL #	CLASSIFICATION SYSTEM: Unified / SAMPLE DESCRIPTION	DEPTH OF CHANGE	QP (tsf)	N/6"	REMARK #
								Brown Limestone, Porous				
								(Driller estimate 100 gpm)				
30												8
35								S.A.A				
40												
45												
								S.A.A.				
50												9

WELL INSTALLED: YES X NO__
COMMENTS _____

GEOLOGIST SIGNATURE _____

DATE/TIME OF COMPLETIONS
BORING 6-19-87/1430
WELL INSTALLATION 6-25-87/1500
WELL PROTECTION 6-25-87/1500

JOHN MATHES & ASSOCIATES, INC.

GEOLOGIC DRILLING COMMENTS

BORING NO. G101D JMA PROJECT NO. 12872832 DATE 6-19-87

REMARK NO.	REMARKS
8	Ø ND w/HNU
9	Ø ND w/HNU

WATER LEVELS

REFERENCE POINT	DATE	TIME	DEPTH (FT.)	COMMENTS	TECH.

GEOLOGIC LOG

SERIAL NO. GL_____
PAGE 1 OF 2

BORING NO. G102D
DATE/TIME STARTED 6-23-87/0730 PROJECT NO. 12872832
PROJECT NAME Morrison Phase 1 RI MAJOR TASK 2292 SUBTASK -
ELEV._____ DRILLING METHOD (S) Air Rotary

DRILLER Elders, L HELPER Elders, T
RIG MAKE/MODEL IR T4

DEPTH	SAMPLE NO.	SAMPLE INTERVAL	SAMPLE TYPE	RECOVERY	SAMPLE RETAINED JAR NO.	SAMPLE RETAINED JAR INTERVAL	SAMPLE LABEL SERIAL #	CLASSIFICATION SYSTEM: Unified SAMPLE DESCRIPTION	DEPTH OF CHANGE	QP (tsf)	N/6"	REMARK #
55								Brown-Gray LIMESTONE, Dolomite Dry	55.5'			
60								SAA				
65								Dry LIMESTONE				
70									72'			4
								Red-Brown CLAY & LIMESOTNE w/ Chert Fragments, Wet, Saturated				5 6
75												

WELL INSTALLED: YES X NO__
COMMENTS_____

GEOLOGIST SIGNATURE_____

DATE/TIME OF COMPLETIONS
BORING 6-23-87/1200
WELL INSTALLATION 6-23-87/1730
WELL PROTECTION 6-23-87/1730

GEOLOGIC DRILLING COMMENTS

BORING NO. G102D JMA PROJECT NO. 12872832 DATE 6-23-87

REMARK NO.	REMARKS
4	Encountered H_2O @ 72.0' (within clay & Limestone Fragment Cavity).
5	Pulled rods up open hole to 72.0'.
6	(See page 3 of 3)

WATER LEVELS

REFERENCE POINT	DATE	TIME	DEPTH (FT.)	COMMENTS	TECH.
Ground Surface	6-23-87	1030	72.0'	During Drilling	CM

GEOLOGIC LOG

SERIAL NO. GL_____
PAGE 1 OF 2

BORING NO. G101D (A)
DATE/TIME STARTED 6-16-87/0930 & 6-17-87/0800 PROJECT NO. 12872832
PROJECT NAME Morrison Phase 1 RI MAJOR TASK 2292 SUBTASK -
ELEV._____ DRILLING METHOD (S) Air Rotary

DRILLER Elders, L. HELPER Elders, T
RIG MAKE/MODEL IR T4

DEPTH	SAMPLE NO.	SAMPLE INTERVAL	SAMPLE TYPE	RECOVERY	SAMPLE RETAINED JAR NO.	SAMPLE RETAINED JAR INTERVAL	SAMPLE LABEL SERIAL #	CLASSIFICATION SYSTEM: Unified / SAMPLE DESCRIPTION	DEPTH OF CHANGE	QP (tsf)	N/6"	REMARK #
								Brown Clayey, Silty, SAND				
								w/Gray Silty Sand Lensing				
								(6") SM				
								Gray @ 3.0'	3'			1
									5'			2
5								Gray Fine-Medium SAND w/Silt,				
								Wet, SM				
10								Medium Gravel w/Fine Sand, GP	11'			3
15												4
												5
												6
20												
25												

WELL INSTALLED: YES X NO__
COMMENTS_____

GEOLOGIST SIGNATURE_____

DATE/TIME OF COMPLETIONS
BORING Backfilled 6-17-87
WELL INSTALLATION N/A
WELL PROTECTION N/A

JOHN MATHES & ASSOCIATES, INC.

GEOLOGIC DRILLING COMMENTS

BORING NO. G101D (A) JMA PROJECT NO. 12872832 DATE 6-16 & 17-87

REMARK NO.	REMARKS
1	Ø ND w/HNU in drill rods
2	H_2O @ 5.0'
3	Rod vibrations during drilling
4	Material falling in on bit.
5	Pulled rods, hole collapsed to 5.0' (water table) will install 8" casing 6-17-87 TOB 15.0' Open Hole 5.0'
6	6-17-87/0800 Ready to install 8" casing using 10" roller bit, hole caved & blew out void under jack stand. Moved hole up 5' Backfilled hole w/spoils

WATER LEVELS

REFERENCE POINT	DATE	TIME	DEPTH (FT.)	COMMENTS	TECH.
Ground Surface	7-16-87	0950	5.0'	Encountered During Drilling	CM

GEOLOGIC LOG

SERIAL NO. GL_____
PAGE 1 OF 2

BORING NO. G101D
DATE/TIME STARTED 6-19-87/0600 PROJECT NO. 12872832
PROJECT NAME Morrison Phase 1 RI MAJOR TASK 2292 SUBTASK _____
ELEV. _____ DRILLING METHOD (S) Air Rotary

DRILLER Elders, L HELPER Elders, T
RIG MAKE/MODEL IR T4

DEPTH	SAMPLE NO.	SAMPLE INTERVAL	SAMPLE TYPE	RECOVERY	SAMPLE RETAINED JAR NO.	SAMPLE RETAINED JAR INTERVAL	SAMPLE LABEL SERIAL #	CLASSIFICATION SYSTEM: Unified SAMPLE DESCRIPTION	DEPTH OF CHANGE	QP (tsf)	N/6"	REMARK #
								Gray-Brown Limestone, Slightly Porous				
200												13
								S.A.A.				
225												
- Interval Change								Gray-Brown Limestone				
230								More Gray @230'	230'			14
235												15
								Gray-Brown Limestone				16
									237'			
								Gray-Green Shale Trace Sand Partings, Possible Weathered				
240								Gray-Green Shale, Hard	239'			
								TOB @ 239.0'				

WELL INSTALLED: YES x NO __
COMMENTS _____

GEOLOGIST SIGNATURE _____

DATE/TIME OF COMPLETIONS
BORING 6-19-87/1430
WELL INSTALLATION 6-25-87/1500
WELL PROTECTION 6-25-87/1500

GEOLOGIC DRILLING COMMENTS

BORING NO. G101D JMA PROJECT NO. 12872832 DATE 6-19-87

REMARK NO.	REMARKS
13	Ø ND w/HNU
14	Harder drilling @230'
15	Hard drilling @ 236'
16	Encountered shale , medium drilling @237'
17	Compent shale @239'. Bit felt burnt. Driller terminated hole. Total estimated of H_2O pumped out of hole 12000 gallons. H_2O used ± 50 gallons.

WATER LEVELS

REFERENCE POINT	DATE	TIME	DEPTH (FT.)	COMMENTS	TECH.
Ground Surface	6-19-87	1500	6.0'	Open hole to 239.0'	CM

GEOLOGIC LOG

SERIAL NO. GL_____
PAGE 1 OF 2

BORING NO. G101D
DATE/TIME STARTED 6-19-87/0600 PROJECT NO. 12872832
PROJECT NAME Morrison Phase 1 RI MAJOR TASK 2292 SUBTASK -
ELEV._____ DRILLING METHOD (S) Air Rotary

DRILLER Elders, L HELPER Elders, T
RIG MAKE/MODEL IR T4

DEPTH	SAMPLE NO.	SAMPLE INTERVAL	SAMPLE TYPE	RECOVERY	SAMPLE RETAINED JAR NO.	SAMPLE RETAINED JAR INTERVAL	SAMPLE LABEL SERIAL #	CLASSIFICATION SYSTEM: Unified SAMPLE DESCRIPTION	DEPTH OF CHANGE	QP (tsf)	N/6"	REMARK #
								Brown-Light Brown Limestone,				
								Porous (100 gpm)				
75												
									90'			10
								Gray-Brown Limestone, Slightly				
100								Porous (Driller 80 gpm				11
								Recovery)				
125								Gray-Brown Limestone				
150												
								S.A.A.				
175												12

WELL INSTALLED: YES X NO__
COMMENTS_____

GEOLOGIST SIGNATURE_____

DATE/TIME OF COMPLETIONS
BORING 6-19-87/1430
WELL INSTALLATION 6-25-87/1500
WELL PROTECTION 6-25-87/1500

JOHN MATHES & ASSOCIATES, INC.

GEOLOGIC DRILLING COMMENTS

BORING NO. G101D JMA PROJECT NO. 12872832 DATE 6-19-87

REMARK NO.	REMARKS
10	Change in porosity
11	Change in porosity Ø ND w/HNU
12	Ø ND w/HNU

WATER LEVELS

REFERENCE POINT	DATE	TIME	DEPTH (FT.)	COMMENTS	TECH.

GEOLOGIC LOG

SERIAL NO. GL_____
PAGE 1 OF 2

BORING NO. G103S
DATE/TIME STARTED 6-24-87/0730 PROJECT NO. 12872832
PROJECT NAME Morrison Phase 1 RI MAJOR TASK 2292 SUBTASK -
ELEV. _____ DRILLING METHOD (S) Air Rotary

DRILLER Elders, L HELPER Elders, T
RIG MAKE/MODEL _____ T4

DEPTH	SAMPLE NO.	SAMPLE INTERVAL	SAMPLE TYPE	RECOVERY	SAMPLE RETAINED JAR NO.	SAMPLE RETAINED JAR INTERVAL	SAMPLE LABEL SERIAL #	CLASSIFICATION SYSTEM: Unified SAMPLE DESCRIPTION	DEPTH OF CHANGE	QP (tsf)	N/6"	REMARK #
								Brown SILT w/Clay, Wet				
									27'			
								Red-Brown Clay w/Silt, CH, Damp				
30									30.8'			
								Brown LIMESTONE, Damp Porous				
								TOB @ 32.0'				
35												

WELL INSTALLED: YES X NO __
COMMENTS _____

GEOLOGIST SIGNATURE _____

DATE/TIME OF COMPLETIONS
BORING 6-24-87/1100
WELL INSTALLATION 6-24-87/1600
WELL PROTECTION 6-24-87/1600

JOHN MATHES & ASSOCIATES, INC.

GEOLOGIC DRILLING COMMENTS

BORING NO. G103S JMA PROJECT NO. 12872832 DATE 6-24-87

REMARK NO.	REMARKS

WATER LEVELS

REFERENCE POINT	DATE	TIME	DEPTH (FT.)	COMMENTS	TECH.

GEOLOGIC LOG

SERIAL NO. GL_____
PAGE 1 OF 2

BORING NO. G104S
DATE/TIME STARTED 6-17-87/1030 & 6-18-87/1230 PROJECT NO. 12872832
PROJECT NAME Morrison Phase 1 RI MAJOR TASK 2292 SUBTASK -
ELEV._____ DRILLING METHOD (S) Air Rotary

DRILLER Elders, L. HELPER Elders, T.
RIG MAKE/MODEL IR T4

DEPTH	SAMPLE NO.	SAMPLE INTERVAL	SAMPLE TYPE	RECOVERY	SAMPLE RETAINED JAR NO.	SAMPLE RETAINED JAR INTERVAL	SAMPLE LABEL SERIAL #	CLASSIFICATION SYSTEM: Unified SAMPLE DESCRIPTION	DEPTH OF CHANGE	QP (tsf)	N/6"	REMARK #
								Brown Silty SAND Trace CL, SM				
									4'			
5								Brown Sand w/Gravel, Silt Wet (H_2O)				1
												1
10								SAA				
15												
									19'			2
20								Brown Weathered LIMESTONE				3
									22'			
								Brown LIMESTONE (Dolomite) Very Weathered				4 5 6
25								TOB @ 23.9'				
								June 18, 1987/1330				

WELL INSTALLED: YES X NO__
COMMENTS_____

GEOLOGIST SIGNATURE_____

DATE/TIME OF COMPLETIONS
BORING 6-18-87/1330
WELL INSTALLATION 6-18-87/1430
WELL PROTECTION 6-18-87/1430

BORING NO. G104S JMA PROJECT NO. 12872832 DATE 6-17 & 18-87

REMARK NO.	REMARKS
1	Very soft drilling, possible H_2O @ 4.0'. Encountered free H_2O @ 8.0'
2	Firm drilling, possible weathered rock @ 19.0'
3	No cutting return @ 20'
4	Set 23' of 8" casing (23' below ground surface)
5	Ø ND w/HNU & C GA indicator
6	June 18, 1987/1230 * Install well in G104S reamed casing & hole out to 23.9'

WATER LEVELS

REFERENCE POINT	DATE	TIME	DEPTH (FT.)	COMMENTS	TECH.
Ground Surface	6-17-87	1045	8.0'	Free H_2O during drilling	CM
Ground Surface	6-18-87	0800	15'4"	In 8" casing (possible casing plugged)	CM
Ground Surface	6-18-87	1330	+11.0'	Rising in 8" casing	CM
Ground Surface	6-18-87	1340	+ 9.0'	Rising in 8" casing	CM

GEOLOGIC LOG

SERIAL NO. GL_____
PAGE 1 OF 2

BORING NO. G104D
DATE/TIME STARTED 6-17-87/1240 & 6-18-87/0800 PROJECT NO. 12872832
PROJECT NAME Morrison Phase 1 RI MAJOR TASK 2292 SUBTASK -
ELEV. _____ DRILLING METHOD (S) Air Rotary

DRILLER Elders, T HELPER Elders, L
RIG MAKE/MODEL IR T4

DEPTH	SAMPLE NO.	SAMPLE INTERVAL	SAMPLE TYPE	RECOVERY	SAMPLE RETAINED JAR NO.	SAMPLE RETAINED JAR INTERVAL	SAMPLE LABEL SERIAL #	CLASSIFICATION SYSTEM: Unified SAMPLE DESCRIPTION	DEPTH OF CHANGE	QP (tsf)	N/6"	REMARK #
								Brown Silty Clay SAND, SM				
									4'			
5								Brown Sandy Gravel w/Silt Moist				
									8'			1
10								Brown-Dark Brown, Wet				
15												
									19'			2
20								Brown Clay, Sand, Weathered Limestone				
									22'			3 4 5
								Brown Weathered Limestone				
25								Brown Weathered Limestone Better Drilling				

WELL INSTALLED: YES X NO __
COMMENTS _____

GEOLOGIST SIGNATURE _____

DATE/TIME OF COMPLETIONS
BORING 6-22-87/1430
WELL INSTALLATION 6-22-87/1600
WELL PROTECTION 6-22-87/1600

JOHN MATHES & ASSOCIATES, INC.

GEOLOGIC DRILLING COMMENTS

BORING NO. G104D JMA PROJECT NO. 12872832 DATE 6-17 & 18-87

REMARK NO.	REMARKS
1	Encountered H_2O @ 8.0'
2	No return on cuttings, weathered rock zone
3	Set 22'-8" casing (22' below ground surface)
4	Ø ND w/HNU & combustible gas indicator in 8" casing
5	June 18, 1987 advanced hole for 6" casing 0800 began drilling

WATER LEVELS

REFERENCE POINT	DATE	TIME	DEPTH (FT.)	COMMENTS	TECH.
Ground Surface	6-17-87	1250	8.0	Encountered During Drilling	CM
Ground Surface	6-18-87	0800	10'7"	In 8" Casing	CM

GEOLOGIC LOG

SERIAL NO. GL_____
PAGE 1 OF 2

BORING NO. G105S
DATE/TIME STARTED 6-22-87/0820 PROJECT NO. 12872832
PROJECT NAME Morrison Phase 1 RI MAJOR TASK 2292 SUBTASK -
ELEV. _____ DRILLING METHOD (S) Air Rotary

DRILLER Elders, L HELPER Elders, T
RIG MAKE/MODEL LR T4

DEPTH	SAMPLE NO.	SAMPLE INTERVAL	SAMPLE TYPE	RECOVERY	SAMPLE RETAINED JAR NO.	SAMPLE RETAINED JAR INTERVAL	SAMPLE LABEL SERIAL #	CLASSIFICATION SYSTEM: Unified / SAMPLE DESCRIPTION	DEPTH OF CHANGE	QP (tsf)	N/6"	REMARK #
								Dark Brown Silty Fine SAND				
								Trace Clay, SM, Wet				
30												
35								Dark Brown Silty Fine SAND,				
								Trace Clay, SM, Wet				
40												
45								Dark Brown Silty Fine Sand				
								Trace Clay, Wet, SM				
50								TOB @ 53.0'				5

WELL INSTALLED: YES X NO__
COMMENTS _____

GEOLOGIST SIGNATURE _____

DATE/TIME OF COMPLETIONS
BORING 6-22-87/1000
WELL INSTALLATION 6-22-87/1200
WELL PROTECTION 6-22-87/1200

GEOLOGIC DRILLING COMMENTS

BORING NO. G105S JMA PROJECT NO. 12872832 DATE 6-22-87

REMARK NO.	REMARKS
5	(see page 1 of 2)

WATER LEVELS

REFERENCE POINT	DATE	TIME	DEPTH (FT.)	COMMENTS	TECH.

GEOLOGIC LOG

SERIAL NO. GL_____
PAGE 1 OF 2

BORING NO. G104D
DATE/TIME STARTED 6-18-87/0800 & 6-22-87/1330 PROJECT NO. 122872832
PROJECT NAME Morrison Phase 1 RI MAJOR TASK 2292 SUBTASK -
ELEV. _____ DRILLING METHOD (S) Air Rotary

DRILLER Edlers, L HELPER Edlers, T
RIG MAKE/MODEL IR T4

DEPTH	SAMPLE NO.	SAMPLE INTERVAL	SAMPLE TYPE	RECOVERY	SAMPLE RETAINED JAR NO.	SAMPLE RETAINED JAR INTERVAL	SAMPLE LABEL SERIAL #	CLASSIFICATION SYSTEM: Unified / SAMPLE DESCRIPTION	DEPTH OF CHANGE	QP (tsf)	N/6"	REMARK #
								Brown LIMESTONE, Fractured				6
								Very Porous				
30								Brown Fractured LIMESTONE,				7
								Porous, Weathered				
								Brown LIMESTONE Dry				
35								Brown-Gray LIMESTONE, Dolomite				8
								Porous				
40												
45								SAA				
50								TOB @ 50.0'				

WELL INSTALLED: YES X NO__
COMMENTS _____

GEOLOGIST SIGNATURE _____

DATE/TIME OF COMPLETIONS
BORING 6-22-87/1000
WELL INSTALLATION 6-22-87/1200
WELL PROTECTION 6-22-87/1200

JOHN MATHES & ASSOCIATES, INC.

GEOLOGIC DRILLING COMMENTS

BORING NO. G104D JMA PROJECT NO. 12872832 DATE 6-18-87

REMARK NO.	REMARKS
6	Highly fractured zone, producing large amounts H_2O
7	Set 6" casing 30'7" below ground surface
	Grout Mix-58 gallon H_2O
	6 sacks cement (port type 1)
	32 #'s bentonite (aqua gel)
8	Encountered H_2O @ 37.0' from 31-37' Limestone was dry
	upper H_2O was blocked off

WATER LEVELS

REFERENCE POINT	DATE	TIME	DEPTH (FT.)	COMMENTS	TECH.
Ground Surface	6-22-87	1345	37.0	During Drilling	CM

GEOLOGIC LOG

SERIAL NO. GL_____
PAGE 1 OF 2

BORING NO. G105D
DATE/TIME STARTED 6-16-87/1245 & 6-21-87/1430 PROJECT NO. 12872832
PROJECT NAME Morrison Phase 1 RI MAJOR TASK 2292 SUBTASK -
ELEV._____ DRILLING METHOD (S) Air Rotary

DRILLER Elders, L HELPER Elders, T
RIG MAKE/MODEL IR T4

DEPTH	SAMPLE NO.	SAMPLE INTERVAL	SAMPLE TYPE	RECOVERY	SAMPLE RETAINED JAR NO.	SAMPLE RETAINED JAR INTERVAL	SAMPLE LABEL SERIAL #	CLASSIFICATION SYSTEM: Unified SAMPLE DESCRIPTION	DEPTH OF CHANGE	QP (tsf)	N/6"	REMARK #
								Brown LIMESTONE, Silty				
								Weathered, Moist				
30												
35												
40								(Brown Limestone, Wet, Free H_2O	41'			4 5 6
								Brown Limestone, Dolomite Wet				
								Fractured				
45												
								Yellow-Green CLAY (Gummy)	46'			7
								Very Wet				
								Brown LIMESTONE, Dolomite	49'			
50								TOB @ 55.9'				

WELL INSTALLED: YES X NO__
COMMENTS_____

GEOLOGIST SIGNATURE_____

DATE/TIME OF COMPLETIONS
BORING 6-21-87/1545
WELL INSTALLATION 6-21-87/1700
WELL PROTECTION 6-21-87/1700

GEOLOGIC DRILLING COMMENTS

BORING NO. G105S JMA PROJECT NO. 12872832 DATE 6-16-87

REMARK NO.	REMARKS
4	Encountered H_2O during drilling. Stopped to set 6" casing, cave to 39.0'
	Casing TOB @ 38'6"
	Grout was 66 gals H_2O
	6.6 sacks cement (Port Type 1)
	37# Bentonite (Aqua Gel)
5	Ø ND w/HNU in borehole
6	June 21, 1987/1450 began drilling to advance hole encountered H_2O @ 42.0'.
7	Encountered squeeze clay @ 46'-49'

WATER LEVELS

REFERENCE POINT	DATE	TIME	DEPTH (FT.)	COMMENTS	TECH.
Ground Surface	6-16-87	1500	41.0'	Encountered H_2O	CM
Ground Surface	6-21-87	1430	42.0'	" "	CM

GEOLOGIC LOG

SERIAL NO. GL_____
PAGE 1 OF 2

BORING NO. G105D
DATE/TIME STARTED 6-16-87/1245 & 6-21-87/1430 PROJECT NO. 12872832
PROJECT NAME Morrison Phase 1 RI MAJOR TASK 2292 SUBTASK -
ELEV. _____ DRILLING METHOD (S) Air Rotary

DRILLER Elders, L HELPER Elders, T
RIG MAKE/MODEL IR T4

DEPTH	SAMPLE NO.	SAMPLE INTERVAL	SAMPLE TYPE	RECOVERY	SAMPLE RETAINED JAR NO.	SAMPLE RETAINED JAR INTERVAL	SAMPLE LABEL SERIAL #	CLASSIFICATION SYSTEM: Unified / SAMPLE DESCRIPTION	DEPTH OF CHANGE	QP (tsf)	N/6"	REMARK #
								Light Brown Silt w/Clay, Trace Gravel, FILL				
								Gravelly, FILL, ML	3'			1
5												
10									10'			
								Light Brown Silt w/Shale Fragments (possible silty shale) TILL, Very Dry, ML				
15												
									19'			2
20								Light Brown LIMESTONE, Very Dry	21'			3
									23'			
								Moist Brown LIMESTONE, Slightly Weathered				
25												

WELL INSTALLED: YES X NO__
COMMENTS _____

GEOLOGIST SIGNATURE _____

DATE/TIME OF COMPLETIONS
BORING 6-21-87/1545
WELL INSTALLATION 6-21-87/170
WELL PROTECTION 6-21-87/1700

GEOLOGIC DRILLING COMMENTS

BORING NO. G105D JMA PROJECT NO. 12872832 DATE 6-16-87

REMARK NO.	REMARKS
1	Fill encountered @ 3.0'
2	Top of rock @ 19.0' dry
3	Moist possible H_2O @ 20'10"

WATER LEVELS

REFERENCE POINT	DATE	TIME	DEPTH (FT.)	COMMENTS	TECH.

GEOLOGIC LOG

SERIAL NO. GL_____
PAGE 1 OF 2

BORING NO. G106D
DATE/TIME STARTED 6-24-87/1240 PROJECT NO. 12872832
PROJECT NAME Morrison Phase 1 RI MAJOR TASK 2292 SUBTASK -
ELEV._____ DRILLING METHOD (S) Air Rotary

DRILLER Elders, L HELPER Elders, T
RIG MAKE/MODEL IR T4

DEPTH	SAMPLE NO.	SAMPLE INTERVAL	SAMPLE TYPE	RECOVERY	SAMPLE RETAINED JAR NO.	SAMPLE RETAINED JAR INTERVAL	SAMPLE LABEL SERIAL #	CLASSIFICATION SYSTEM: Unified SAMPLE DESCRIPTION	DEPTH OF CHANGE	QP (tsf)	N/6"	REMARK #
								Gray-Brown Loose Rock, Gravel & Sand, Disturbed, FILL				
5								Brown LIMESTONE, Dolomite	4'			
10								Brown Limestone, Dolomite Damp (Possible H_2O Zone)				
15								Gray-Brown LIMESTONE, Dolomite, Wet				1
20												
25								SAA				

WELL INSTALLED: YES X NO__
COMMENTS_____

GEOLOGIST SIGNATURE_____

DATE/TIME OF COMPLETIONS
BORING 6-24-87/1430
WELL INSTALLATION 6-24-87/1515
WELL PROTECTION 6-24-87/1515

JOHN MATHES & ASSOCIATES, INC.

GEOLOGIC DRILLING COMMENTS

BORING NO. G106D JMA PROJECT NO. 12872832 DATE 6-24-87

REMARK NO.	REMARKS
1	Encountered H_2O @ 17.0'

WATER LEVELS

REFERENCE POINT	DATE	TIME	DEPTH (FT.)	COMMENTS	TECH.
Ground Surface	6-24-87	1300	17.0'	During Drilling	CM
Ground Surface	6-24-87	1500	7'5"	In Open Bore Hole	CM

GEOLOGIC LOG

SERIAL NO. GL_____
PAGE 1 OF 2

BORING NO. G106D
DATE/TIME STARTED 6-24-87/1240
PROJECT NAME Morrison Phase 1 RI
ELEV._____ DRILLING METHOD (S) Air Rotary
PROJECT NO. 12872832
MAJOR TASK 2292 SUBTASK -

DRILLER Elders, T Elders, J HELPER
RIG MAKE/MODEL IR T4

DEPTH	SAMPLE NO.	SAMPLE INTERVAL	SAMPLE TYPE	RECOVERY	SAMPLE RETAINED JAR NO.	SAMPLE RETAINED JAR INTERVAL	SAMPLE LABEL SERIAL #	CLASSIFICATION SYSTEM: Unified / SAMPLE DESCRIPTION	DEPTH OF CHANGE	QP (tsf)	N/6"	REMARK #
								Gray-Brown LIMESTONE, Dolomite				
								Wet.				
								TD 28.0'				2
30												
35												

WELL INSTALLED: YES X NO__
COMMENTS_____

GEOLOGIST SIGNATURE_____

DATE/TIME OF COMPLETIONS
BORING 6-24-87/1430
WELL INSTALLATION 6-24-87/1515
WELL PROTECTION 6-24-87/1515

GEOLOGIC DRILLING COMMENTS

BORING NO. G106D JMA PROJECT NO. 12872832 DATE 6-24-87

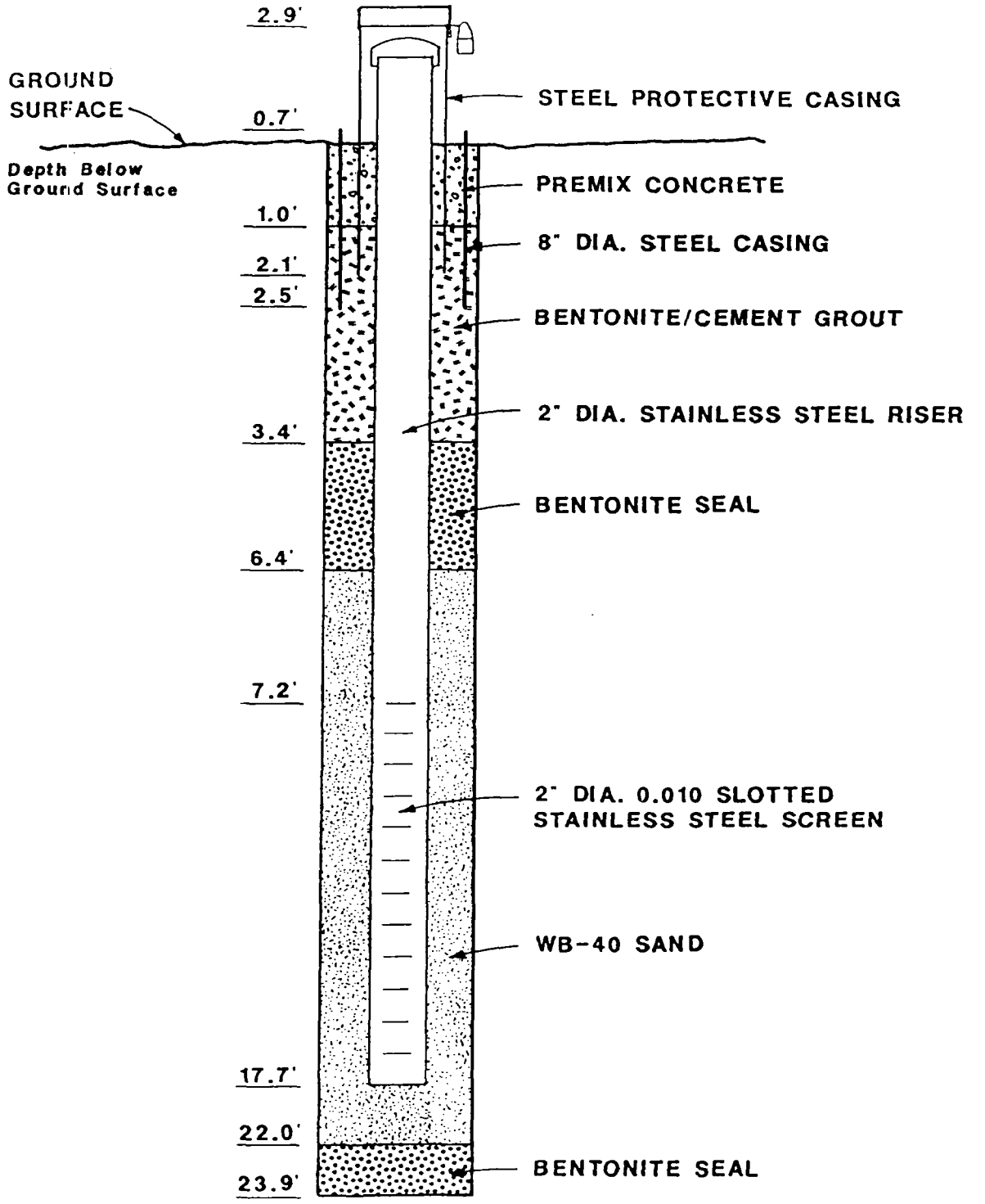
REMARK NO.	REMARKS
2	At completion of drilling, pulled rods & measured H_2O @ 7'5"
	Hole collapsed to 27.5'

WATER LEVELS

REFERENCE POINT	DATE	TIME	DEPTH (FT.)	COMMENTS	TECH.
Ground Surface	6-24-87	1500	7'5"	In Open Hole	CM

PROJECT NO. 12872832 DRILLER SUBCONTRACTOR

MONITORING WELL NO. G104S DATE INSTALLED 6/18/87



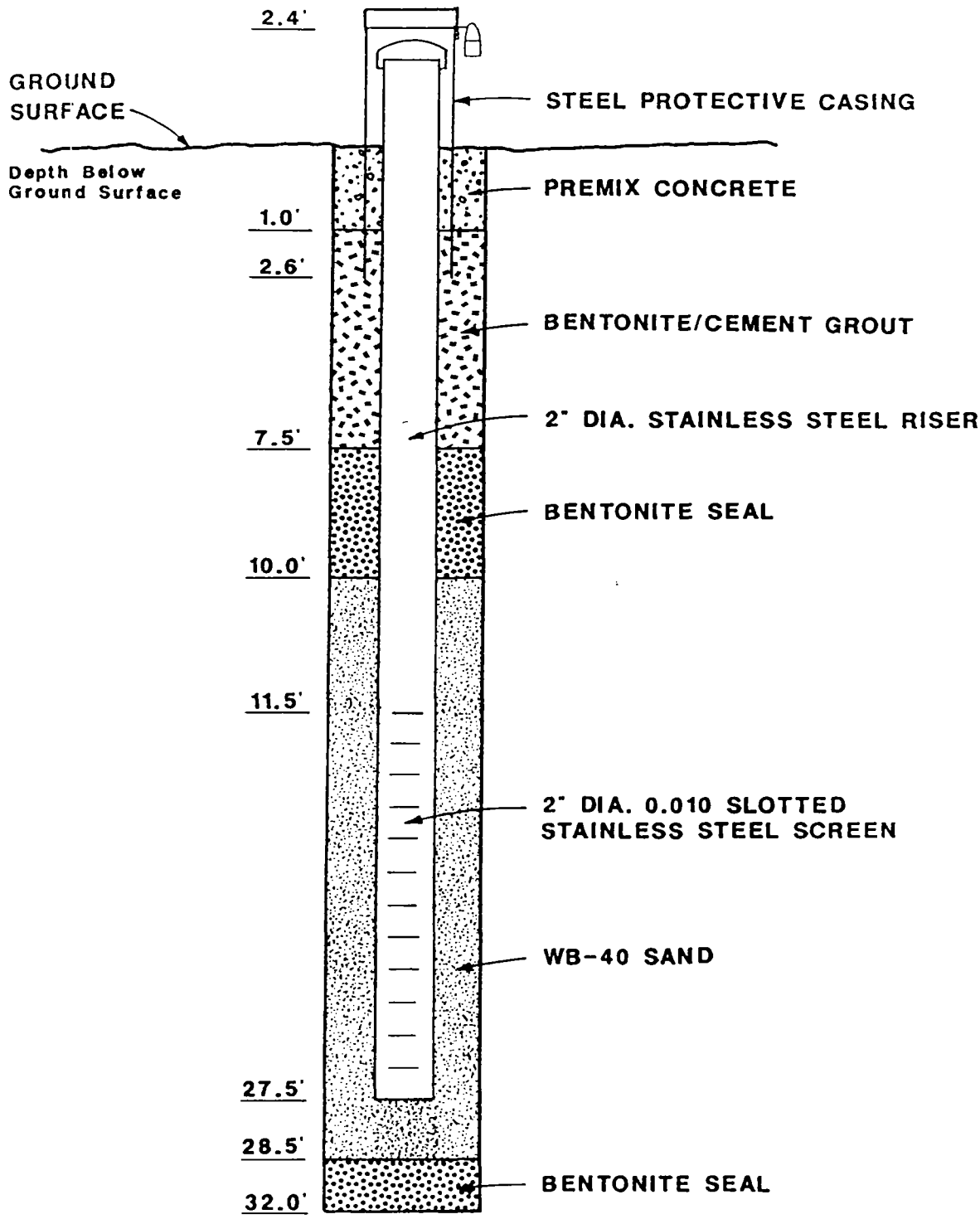
NOT TO SCALE

BOREHOLE DIAMETER 10" SANDPACK WB-40

SCREEN LENGTH 10.5' RISER LENGTH 9.0'

PROJECT NO. 12872832 DRILLER SUBCONTRACTOR

MONITORING WELL NO. G103S DATE INSTALLED 6/24/87



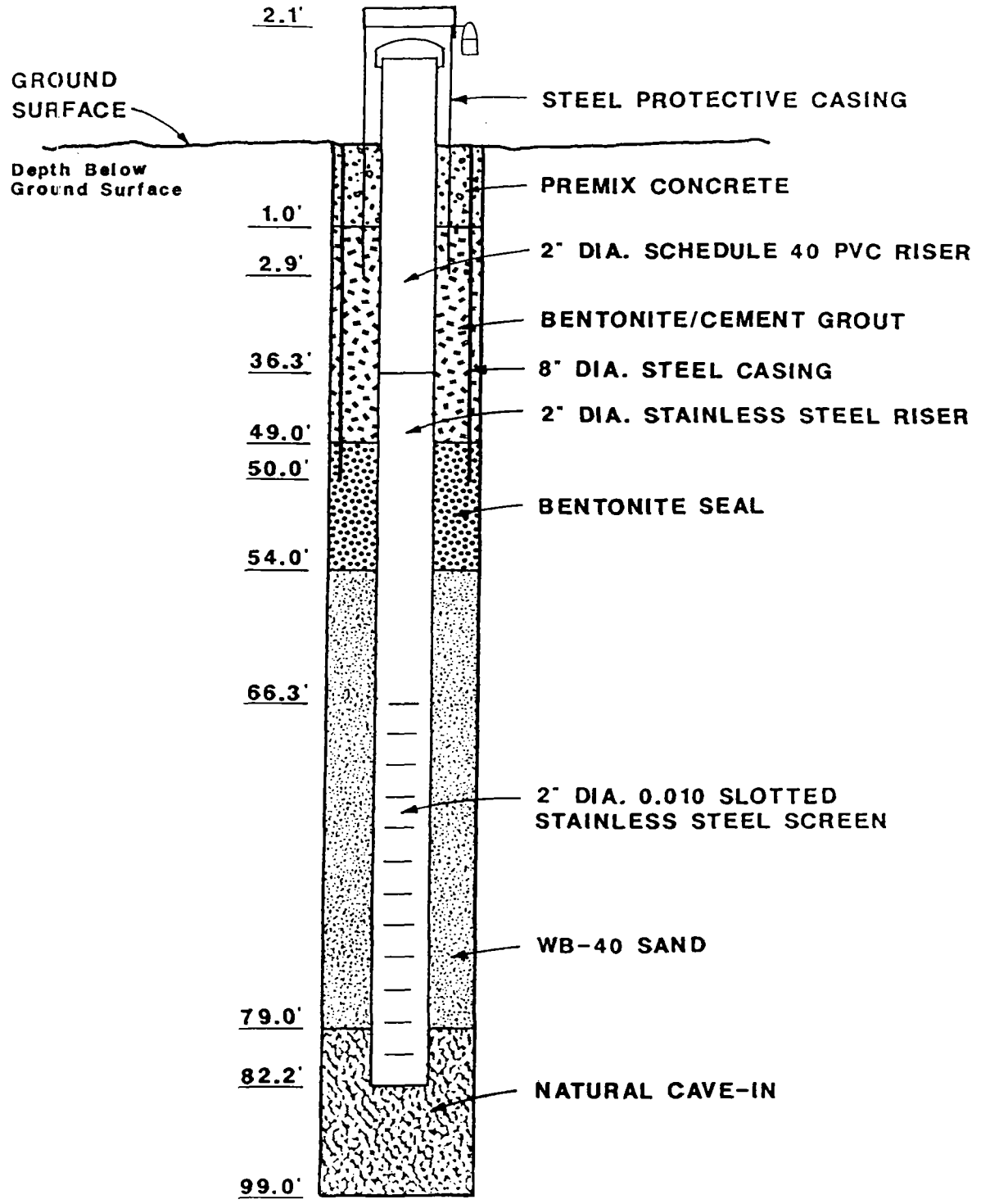
NOT TO SCALE

BOREHOLE DIAMETER 10" SANDPACK WB-40

SCREEN LENGTH 16.0' RISER LENGTH 13.1'

PROJECT NO. 12872832 DRILLER SUBCONTRACTOR

MONITORING WELL NO. G102D DATE INSTALLED 6/23/87



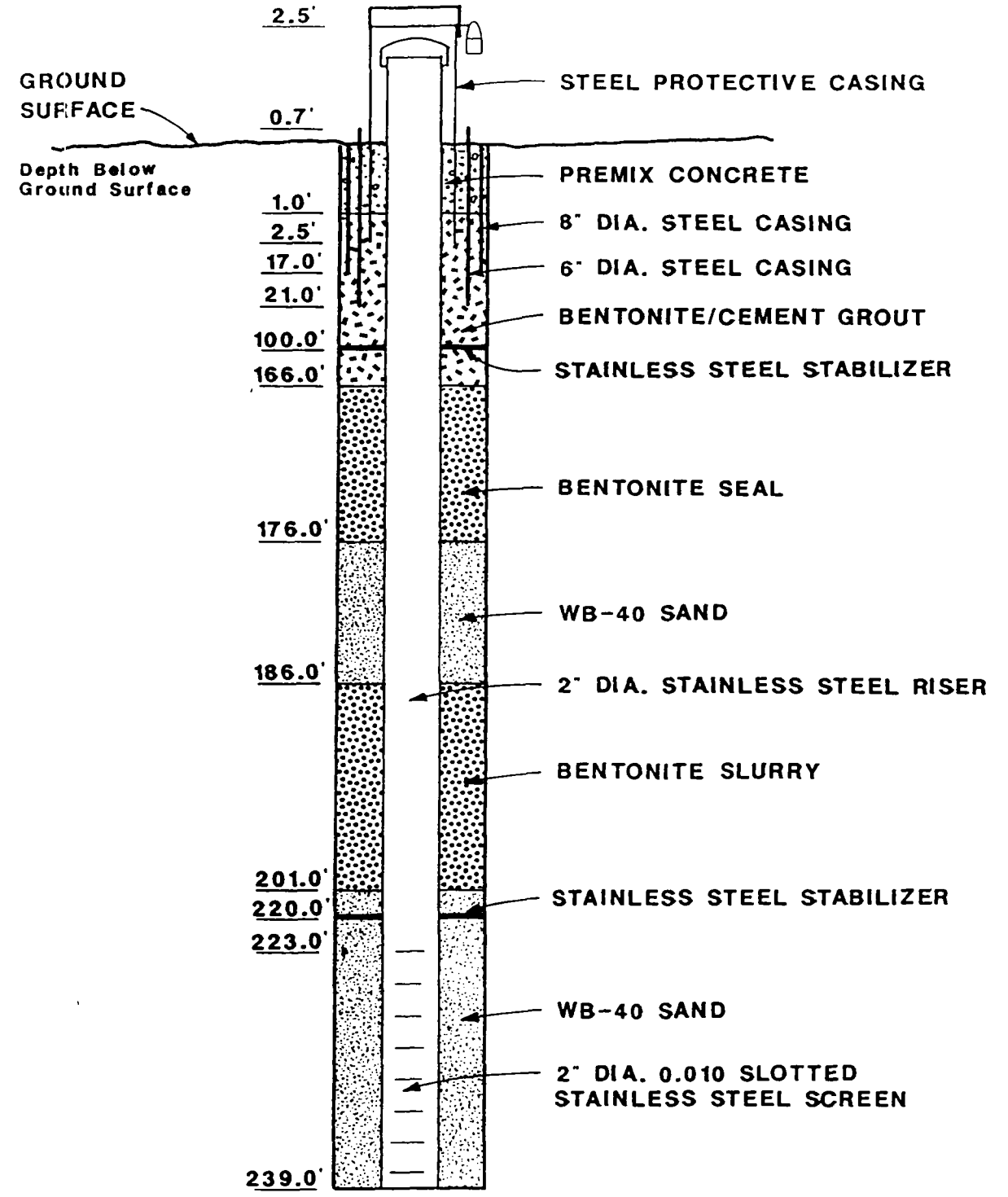
NOT TO SCALE

BOREHOLE DIAMETER 6" SANDPACK WB-40

SCREEN LENGTH 15.9' RISER LENGTH 30' STAINLESS STEEL, 32.1' PVC

PROJECT NO. 12872832 DRILLER SUBCONTRACTOR

MONITORING WELL NO. G101D DATE INSTALLED 6/25/87



NOT TO SCALE

BOREHOLE DIAMETER 6" SANDPACK WB-40

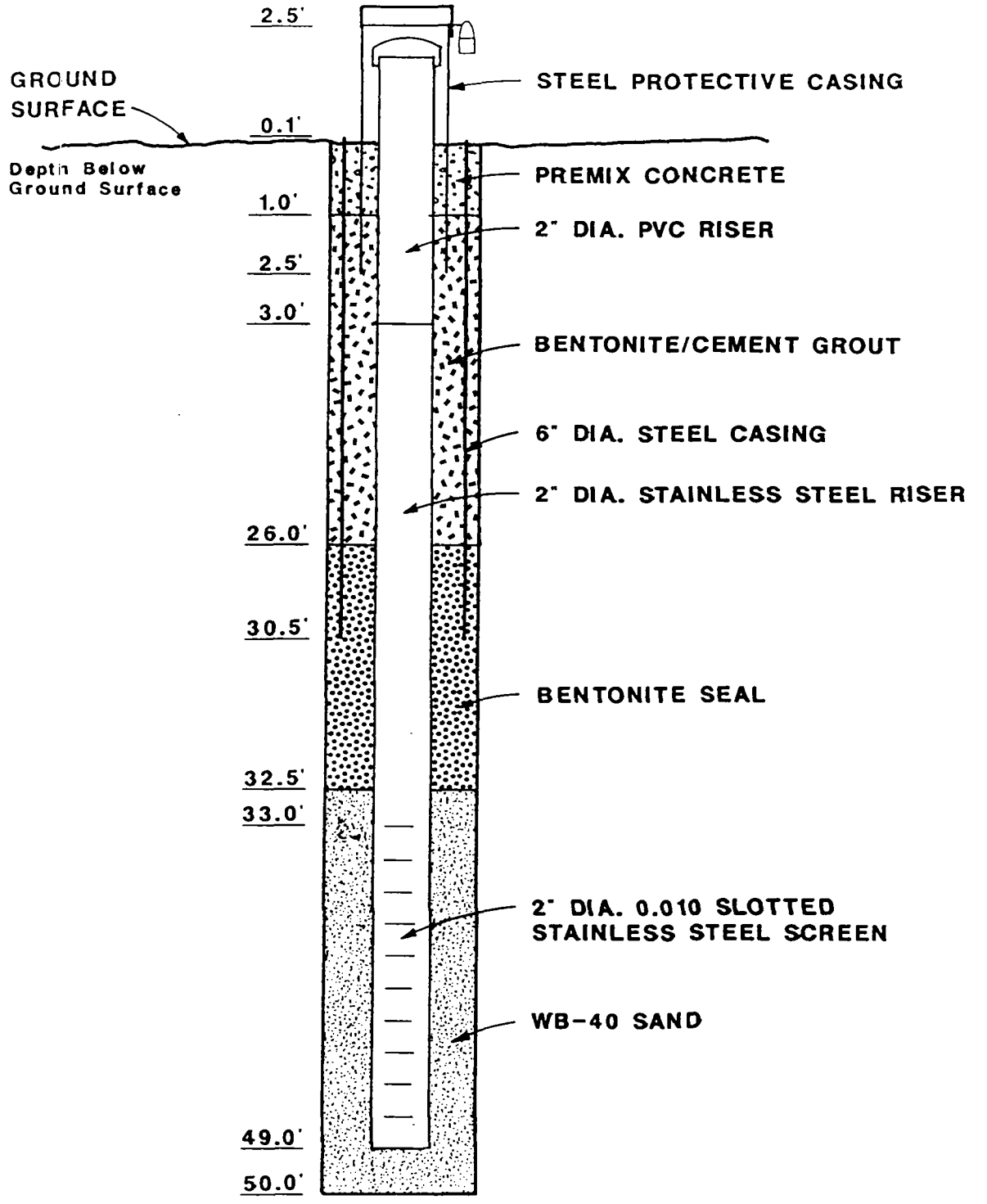
SCREEN LENGTH 16.0' RISER LENGTH 225.2'

APPENDIX C

WELL CONSTRUCTION DIAGRAMS

PROJECT NO. 12872832 DRILLER SUBCONTRACTOR

MONITORING WELL NO. G104D DATE INSTALLED 6/22/87



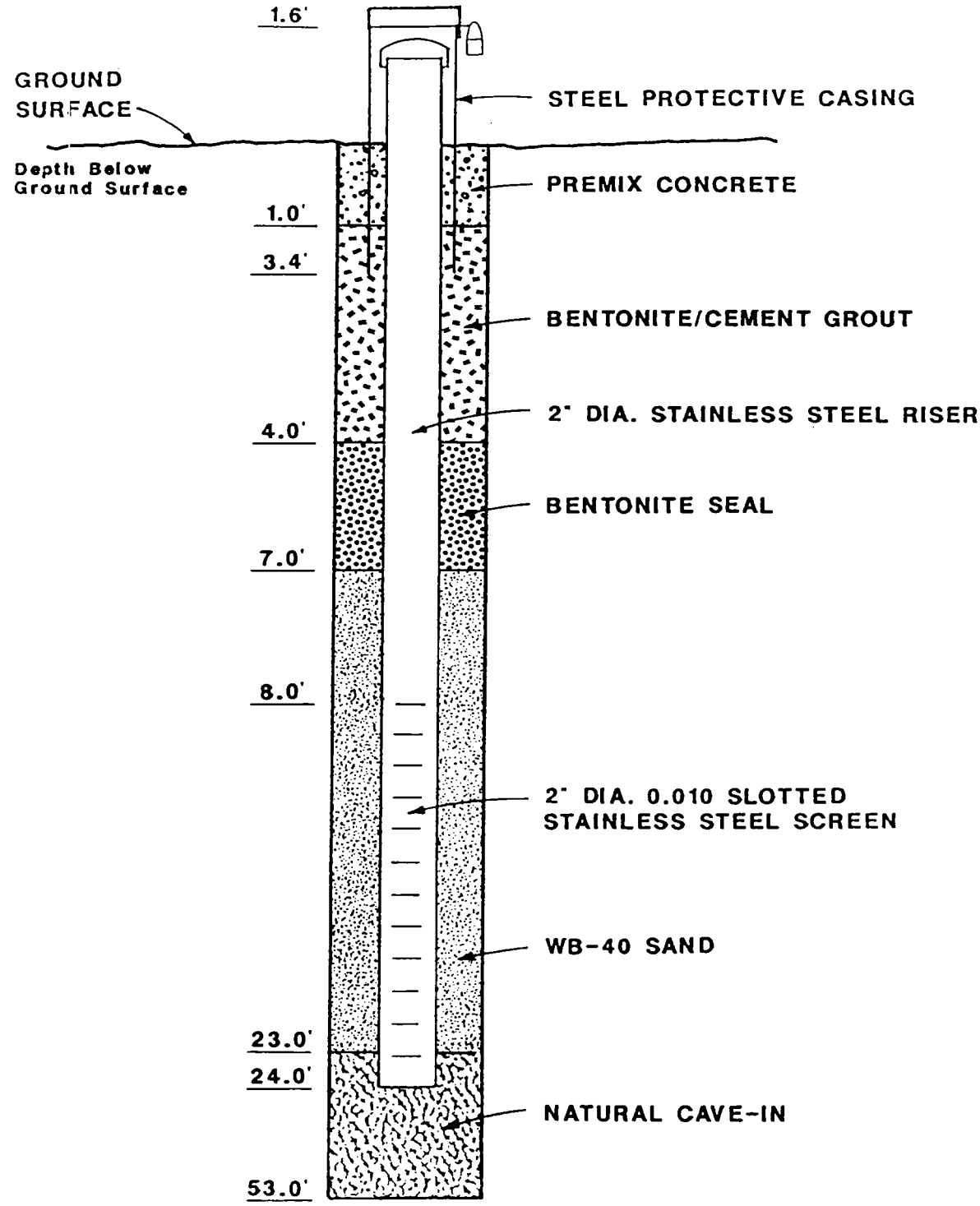
NOT TO SCALE

BOREHOLE DIAMETER 6" SANDPACK WB-40

SCREEN LENGTH 16.0' RISER LENGTH 30.0' STAINLESS STEEL, 5.5' PVC

PROJECT NO. 12872832 DRILLER SUBCONTRACTOR

MONITORING WELL NO. G105S DATE INSTALLED 6/22/87



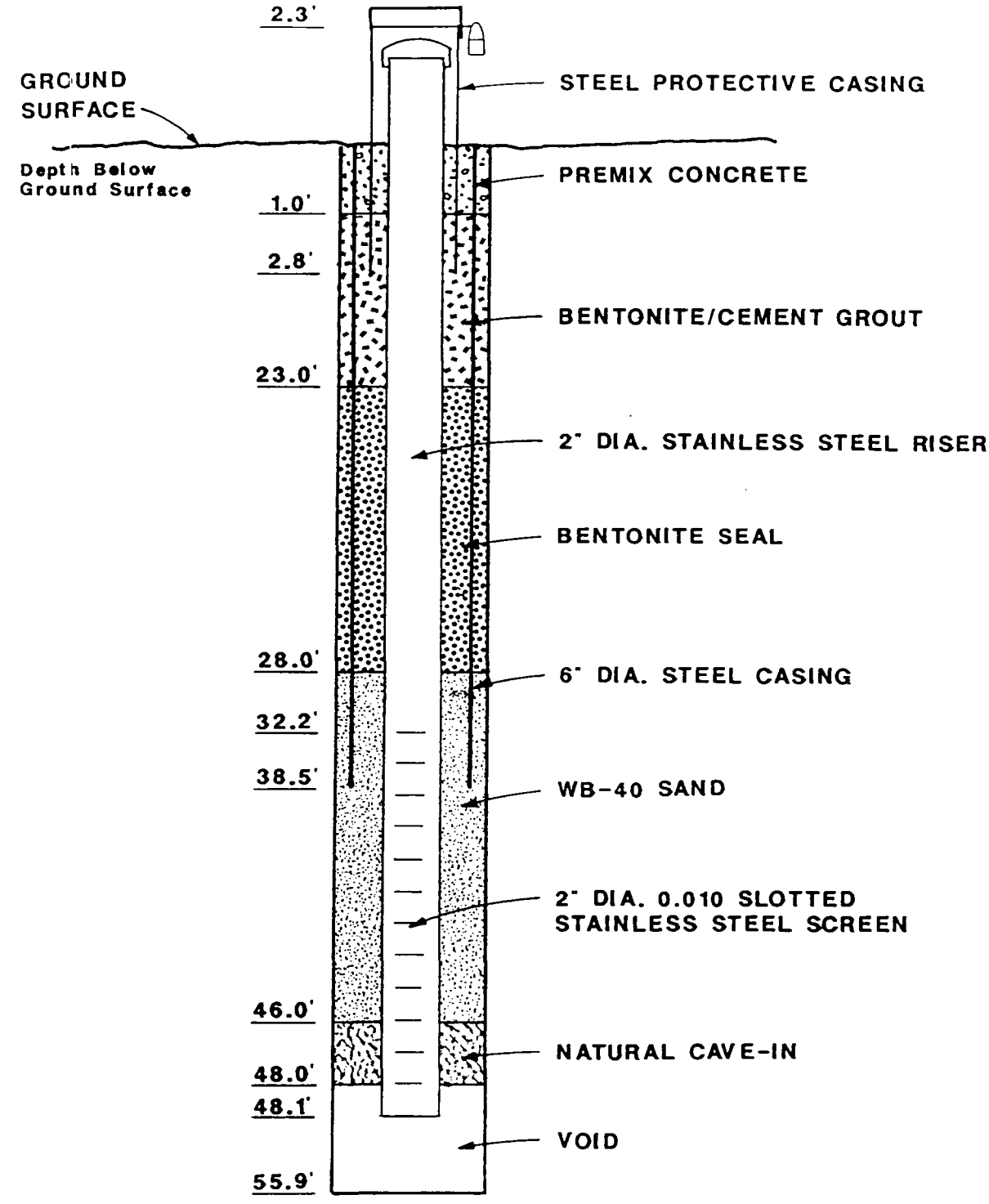
NOT TO SCALE

BOREHOLE DIAMETER 10" SANDPACK WB-40

SCREEN LENGTH 16.0' RISER LENGTH 9.6'

PROJECT NO. 12872832 DRILLER SUBCONTRACTOR

MONITORING WELL NO. G105D DATE INSTALLED 6/21/87



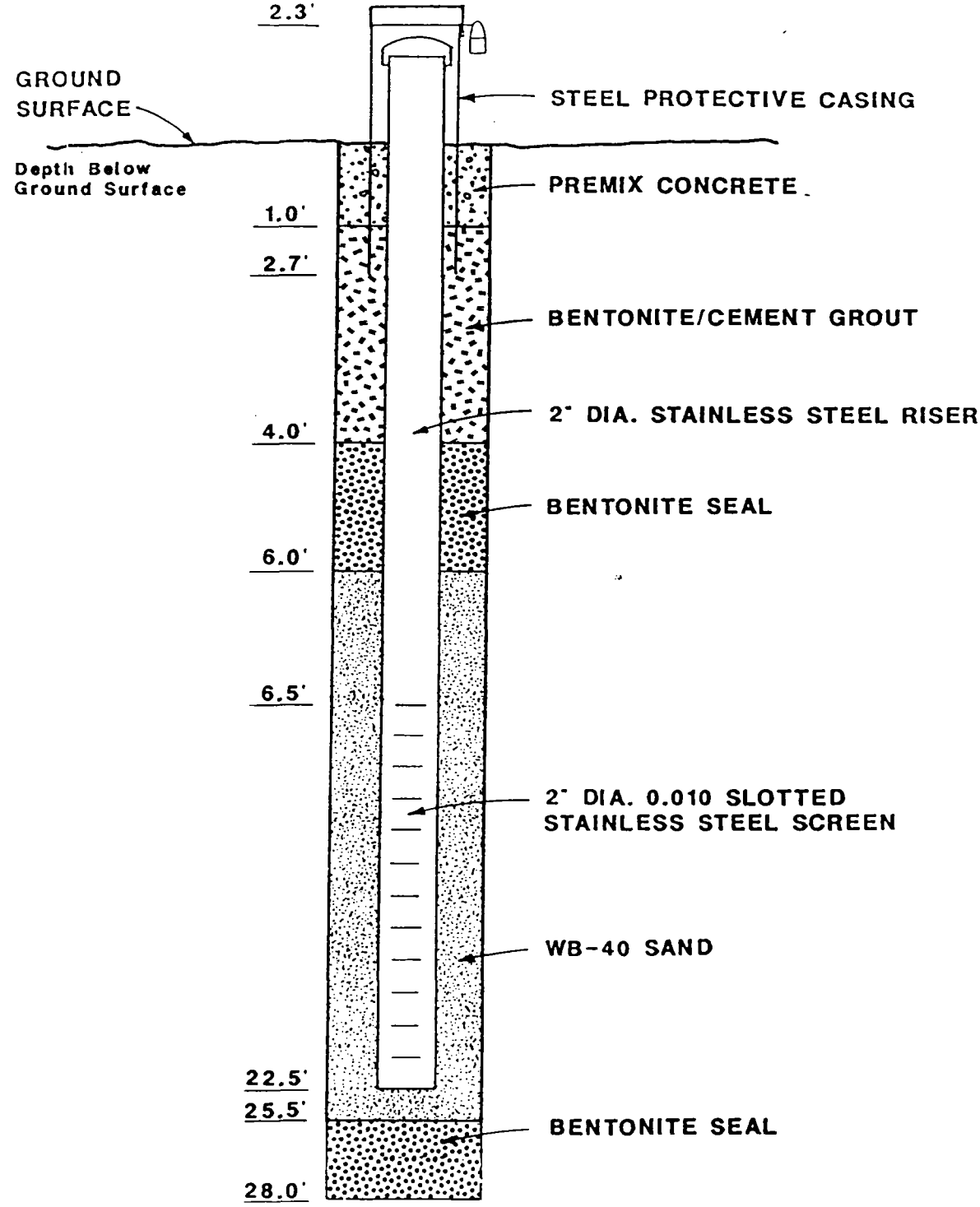
NOT TO SCALE

BOREHOLE DIAMETER 6" SANDPACK WB-40

SCREEN LENGTH 15.9' RISER LENGTH 34.4'

PROJECT NO. 12872832 DRILLER SUBCONTRACTOR

MONITORING WELL NO. G106D DATE INSTALLED 6/24/87



NOT TO SCALE

BOREHOLE DIAMETER 6" SANDPACK WB-40

SCREEN LENGTH 16.0' RISER LENGTH 8.8'

APPENDIX D

WELL DEVELOPMENT AND GROUNDWATER SAMPLING DATA FORMS

WELL DEVELOPMENT & PURGING
GENERAL DATA

SERIAL NO. WDG 00008
PAGE OF

PROJECT NAME Morrison Ph 1 RI
PROJECT NO. 12872832
DATE JUN 27 '87 FORM COMPLETED BY CMZ/OD

BORING/WELL NO. G101D
MAJOR TASK ~~2293~~ 2294 DD SUBTASK —

WELL CONSTRUCTION

TOTAL DEPTH (FT) 239
GRAVEL PACK INTERVAL (FT) 239-200'
WELL PROTECTOR: YES ___ NO ✓
FLUID INJECTED DURING DRILLING (QUANTITY) AIR

BOREHOLE DIAMETER 6"
WELL DIAMETER (ID)(IN) 2"
PADLOCK NO. N/A

WATER VOLUME DATA

DATE OF MEASUREMENT JUN 27 '87
MEASURING POINT Top of Riser
WATER LEVEL INSTRUMENT USED EWI
INTIAL WATER LEVEL (FT) 11' 3½"
LINEAR FEET OF WATER 228
LINEAR FEET SATURATED GRAVEL PACK 38

WATER VOLUMES		
ITEM	VOLUME FT³	VOLUME GALS
WELL CASING		37.21
GRAVEL PACK		15.90
DRILLING FLUIDS	0	0

NOTE: QUANTITIES CALCULATED PRIOR TO DEVELOPMENT

DEVELOPMENT CRITERIA

METHOD OF DEVELOPMENT Purge master
WATER QUALITY MEASUREMENTS: YES ✓ NO ___
WATER VOLUME TO BE REMOVED (GALS) 53.11 (vol.) MINIMUM 80 MAXIMUM 160

NOTE: DEVELOPMENT TO BE PERFORMED IN ACCORDANCE WITH PROJECT SPECIFIC WELL DEVELOPMENT PLAN.

COMMENTS

SERIAL NO. WS _____
PAGE __ OF __

TOTAL VOLUME WATER COLLECTED _____ TOTAL NO. OF CONTAINERS 7
FIELD FILTERED: YES ✓ NO __ TIME 1955 TECH. CMR FILTER TYPE BAKER
SAMPLES COOLED DURING COLLECTION PERIOD: YES ✓ NO __

SAMPLE CONTAINERS

QUANTITY	CONTAINER MATERIAL	SAMPLE LABEL SERIAL NO.	PRESERVATIVES	COMMENTS
40 ML	GLASS	SC000 27	—	VOA
40 ML	"	28	—	VOA
½ GAL	"	29	—	BNA
½ GAL	"	30	—	BNA
1L.	PLASTIC	31	HNO_3	METALS - TOTAL
1L.	"	32	HNO_3	METALS - DISS
1 QT	"	33	—	PRECIPITATION

DOCUMENTATION

SAMPLE CONTAINERS SEALED: YES __ NO ✓ TIME _____ TECHNICIAN _____
SAMPLE SHIPPING CONTAINER SEALED & PACKED: YES ✓ NO __ TIME 2300 TECH CMR
LAB ANALYSIS REQUEST FORM: YES ✓ NO __ TIME 2300 SERIAL NO. CAR 2735 TECH. CMR
CHAIN OF CUSTODY FORM: YES ✓ NO __ TIME 2300 SERIAL NO. 2735 2736 TECH. CMR

COMMENTS: _____

PUMPING TECHNIQUES

DATE	PUMP TYPE	SERIAL NO.	PUMP TECHNICIAN
6/27	CONTRACTOR	—	CM —

WATER REMOVAL DATA

DATE	PUMP ON	PUMP OFF	PUMPING RATE (GPM)	INCREMENTAL GALLONS REMOVED	TOTAL GALLONS REMOVED	INCREMENTAL WELL VOLUMES REMOVED	TOTAL WELL VOLUMES REMOVED	PUMP INTAKE LEVEL	WATER LEVEL BEFORE PUMPING	WATER LEVEL AFTER PUMPING	COMMENTS
6/27	1650	1658	11.3						9'	9'	

WELL DEVELOPMENT & PURGING
GENERAL DATA

SERIAL NO. WDG 00010
PAGE OF

PROJECT NAME Morrison ph 1 RI
BORING/WELL NO. 6104D
PROJECT NO. 12872832
MAJOR TASK 2294 SUBTASK —
DATE JUN 27 '87 FORM COMPLETED BY CAL/DD

WELL CONSTRUCTION

TOTAL DEPTH (FT) 51.13'
BOREHOLE DIAMETER 6"
GRAVEL PACK INTERVAL (FT) —
WELL DIAMETER (ID)(IN) 2"
WELL PROTECTOR: YES ✓ NO —
PADLOCK NO. N/A
FLUID INJECTED DURING DRILLING (QUANTITY) AIR

WATER VOLUME DATA

DATE OF MEASUREMENT JUN 27 '87
MEASURING POINT Top of Riser
WATER LEVEL INSTRUMENT USED EWI
INTIAL WATER LEVEL (FT) 9'1"
LINEAR FEET OF WATER 40'
LINEAR FEET SATURATED GRAVEL PACK 17.5'

WATER VOLUMES		
ITEM	VOLUME FT^3	VOLUME GALS
WELL CASING		30.12
GRAVEL PACK		6.53
DRILLING FLUIDS	0	2
		36.53

NOTE: QUANTITIES CALCULATED PRIOR TO DEVELOPMENT

DEVELOPMENT CRITERIA

METHOD OF DEVELOPMENT Contractors pump, Teflon Bailer
WATER QUALITY MEASUREMENTS: YES ✓ NO —
WATER VOLUME TO BE REMOVED (GALS) 36.5 MINIMUM 55 MAXIMUM 110

NOTE: DEVELOPMENT TO BE PERFORMED IN ACCORDANCE WITH PROJECT SPECIFIC WELL DEVELOPMENT PLAN.

COMMENTS

SAMPLE CONTROL SHEET

SERIAL NO. SCS 00002
PAGE ___ OF ___

PROJECT NAME Morrison PH 1 RI
PROJECT NO. 12822822
SAMPLE LOCATION NO. G1043

DATE Jun 27 '87
SAMPLER CMR
CUSTODIAN CMR

SAMPLE NO.	SAMPLE LABEL NO.	C.O.C. NO.	SHIPPED	LAB ANALYSIS REQUEST NO.
VOA	SL000 20	2665	JUN 29 '87	LAR 2665
VOA	21	↓	↓	↓
BNA	22			
BNA	23			
METALS-TOTAL	24			
METALS-DISS	25			
PREFILTRATION	26			

WELL DEVELOPMENT & PURGING
WATER QUALITY/WATER REMOVAL

SERIAL NO. WD 00008
PAGE ___ OF ___

PROJECT NAME Morrison ph 1 RI
PROJECT NO. 128722832
DATE JUN 27 '87
BORING/WELL NO. 610D
MAJOR TASK ~~2293~~ 2294 00 SUBTASK —
FORM COMPLETED BY CM2/00

WATER QUALITY INSTRUMENTS

DATE	INSTRUMENT	SERIAL NO.	CALIBRATION PERFORMED (✓)	TECHNICIAN
6/27	Orion 210 ph meter	2210	✓	~~D Davenport~~ DD C. Maxeiner
6/27	YSI S-C-T meter	12911	✓	~~D Davenport~~ DD C. Maxeiner

WATER QUALITY READINGS

DATE	TIME	TOTAL GALLONS REMOVED	TOTAL WELL VOLUMES REMOVED	TEMP. (°C)	DISSOLVED OXYGEN MG/L	pH	REDOX (EH) MV	CONDUCTIVITY UMHOS/CM	APPEARANCE	COMMENTS
6/27	2020	200	~~34~~	14.8		7.90		59x10²	CLEAR	
6/27	2030	210	~~34~~	14.8		7.98		60x10²	↓	

NOTES:

1. COMMENTS SHOULD DELINEATE FINAL SAMPLE AND REPLICATE MEASUREMENTS.
2. ANY INSTRUMENTATION CALIBRATION OR USE ANOMALIES SHOULD BE NOTED.
3. APPEARANCE SHOULD BE NOTED BEFORE, DURING, AND AFTER DEVELOPMENT.

PUMPING TECHNIQUES

DATE	PUMP TYPE	SERIAL NO.	PUMP TECHNICIAN
6/27	BUBBLEMASTER	—	CM2
6/27	well wizard	—	CM

WATER REMOVAL DATA

DATE	PUMP ON	PUMP OFF	PUMPING RATE (GPM)	INCREMENTAL GALLONS REMOVED	TOTAL GALLONS REMOVED	INCREMENTAL WELL VOLUMES REMOVED	TOTAL WELL VOLUMES REMOVED	PUMP INTAKE LEVEL	WATER LEVEL BEFORE PUMPING	WATER LEVEL AFTER PUMPING	COMMENTS
6/27	11 00	1500	150 9MS 5gpm						11'	11'	PM
6/27	1500	1900	.25						11'	11'	WW

WATER SAMPLING DATA

SERIAL NO. WS 00008
PAGE __ OF __

PROJECT NAME Morrison Ph 1 RI
SAMPLE LOCATION NO. OR BORING/WELL NO. G101D
PROJECT NO. 12812832
MAJOR TASK 2293 2294 SUBTASK —
TECHNICAL CREW C. Maxeiner / D Davenport
DATE JUN 27 '87
FORM COMPLETED BY CM2/DD

WEATHER Sunny
LEVEL OF PROTECTION A B C (D) *
MEASURING POINT Top of Riser
METHOD OF MEASUREMENT EWI
MEASURING POINT ELEV. ____
INITIAL WATER LEVEL ELEV. ____

SAMPLING METHOD well wizard
INITIAL WATER LEVEL 11' 3½"
SPECIAL SAMPLING METHODS Bladder pump
TIME ELAPSED/FINAL DEVELOPMENT/PURGING 5 (+) TECHNICIAN CM2
SAMPLING DEPTH INTERVAL ~~25'~~ 50'
PUMPING RATE/SAMPLING .25 gpm

WATER QUALITY INSTRUMENTS USED	SERIAL NO.	CALIBRATION REFERENCE
1. Orion 210 pH meter	2210	See Orion 210 ph meter calibration logbook 14
2. YSI S-C-T meter	12911	See YSI S-C-T meter Calibration logbook 13
3. YSI Dissolved Oxygen meter	2992	See YSI D.O. meter Calibration logbook 15
4.		
5.		

FINAL WATER QUALITY INSTRUMENT READINGS

TEMP (°C) 14
CONDUCTIVITY (umhos/cm) 60 x10'
PH 7.88
EH 165
D.O. (mg/l) 3.66
OTHER ____

DUPLICATE WATER SAMPLING DATA INSTRUMENT READINGS

TEMP (°C) 14
CONDUCTIVITY (umhos/cm) 60x10'
PH 7.89
EH 176
D.O. (mg/l) 3.69

TECHNICIAN DD/CM2 TIME START 20:46 TIME FINISH 2055

SAMPLE COLLECTION PERIOD: START 2035 STOP 2055 TECHNICIAN CM2/DD

*NOTE: FOR LEVELS OF PROTECTION; SEE SITE SPECIFIC SAFETY PLAN FOR DETAILS.

SERIAL NO. WS _____
PAGE __ OF __

TOTAL VOLUME WATER COLLECTED _____ TOTAL NO. OF CONTAINERS 7
FIELD FILTERED: YES ✓ NO __ TIME 2040 TECH. CM ✓ FILTER TYPE BARREL
SAMPLES COOLED DURING COLLECTION PERIOD: YES ✓ NO __

SAMPLE CONTAINERS

QUANTITY	CONTAINER MATERIAL	SAMPLE LABEL SERIAL NO.	PRESERVATIVES	COMMENTS
40 ML	GLASS	SL 000 13	—	VOA
"	"	14	—	B/OA
1/2 GAL	"	15	—	BNA
"	"	16	—	BNA
1 L.	PLASTIC	17	1 HNO3	METALS - TOTAL
1 L.	"	18	1 HNO3	METALS - DISS
10 GAL	"	19	—	PREFILTRATION

DOCUMENTATION

SAMPLE CONTAINERS SEALED: YES __ NO ✓ TIME _____ TECHNICIAN _____
SAMPLE SHIPPING CONTAINER SEALED & PACKED: YES ✓ NO __ TIME 2300 TECH. CM
LAB ANALYSIS REQUEST FORM: YES ✓ NO __ TIME 2300 SERIAL NO. CAR 2729 TECH. CM
CHAIN OF CUSTODY FORM: YES ✓ NO __ TIME 2300 SERIAL NO. 2729 / 2736 TECH. CM

COMMENTS: _____

SAMPLE CONTROL SHEET

SERIAL NO. SCS 00001
PAGE ___ OF ___

PROJECT NAME Morrison PH 1 RI
PROJECT NO. 12872832
SAMPLE LOCATION NO. G101D

DATE Jun 20 '87
SAMPLER C. Maxeiner
CUSTODIAN C. Maxeiner

SAMPLE NO.	SAMPLE LABEL NO.	C.O.C. NO.	SHIPPED	LAB ANALYSIS REQUEST NO.
#1 A VOAs	SL00001	2995	Jun 22 '87	2995-1
B	SL00002			2995-1
#2 A	SL00003			2995-2
B	SL00004			2995-2
#3 A	SL00005			2995-3
B	SL00006			2995-3
#4 A	SL00007	2995	Jun 22 '87	2995-4
B	SL00008			2995-4
#5 A	SL00009			2995-5
B	SL00010			2995-5
#6 A	SL00011			2995-6
B	SL00012			2995-6
VOA	SL000 13	2729	Jun 29 '87	LAR-2729
VOA	14			
BNA	15			
BNA	16			
METALS-TOTAL	17			
METALS-DISS	18			
PRECIPITATION	19			

WELL DEVELOPMENT & PURGING
GENERAL DATA

SERIAL NO. WDG 00021
PAGE OF

PROJECT NAME Morrison ph 1 R.I
PROJECT NO. 12872832
DATE JUN 28 '87 FORM COMPLETED BY CAM/DD

BORING/WELL NO. G102D
MAJOR TASK 2294 SUBTASK —

WELL CONSTRUCTION

TOTAL DEPTH (FT) 83.42'
GRAVEL PACK INTERVAL (FT) 82.2 - 54'
WELL PROTECTOR: YES ✓ NO ___
FLUID INJECTED DURING DRILLING (QUANTITY) AIR

BOREHOLE DIAMETER ___
WELL DIAMETER (ID)(IN) 2"
PADLOCK NO. N/A

WATER VOLUME DATA

DATE OF MEASUREMENT JUN 28 '87
MEASURING POINT Top of Riser
WATER LEVEL INSTRUMENT USED EWI
INTIAL WATER LEVEL (FT) 73' 4¼"
LINEAR FEET OF WATER 10.1'
LINEAR FEET SATURATED GRAVEL PACK 10.1'

WATER VOLUMES		
ITEM	VOLUME FT^3	VOLUME GALS
WELL CASING		1.65
GRAVEL PACK		~~14.66~~ 8.33
DRILLING FLUIDS		

NOTE: QUANTITIES CALCULATED PRIOR TO DEVELOPMENT

DEVELOPMENT CRITERIA

METHOD OF DEVELOPMENT Teflon Bailer
WATER QUALITY MEASUREMENTS: YES ✓ NO ___
WATER VOLUME TO BE REMOVED (GALS) 8.5 MINIMUM 12.5 MAXIMUM 25.5

NOTE: DEVELOPMENT TO BE PERFORMED IN ACCORDANCE WITH PROJECT SPECIFIC WELL DEVELOPMENT PLAN.

COMMENTS

WATER SAMPLING DATA

SERIAL NO. WS 00021
PAGE __ OF __

PROJECT NAME Morrison ph 1 RI. SAMPLE LOCATION NO. OR BORING/WELL NO. G102D
PROJECT NO. 12872832 MAJOR TASK 2294 SUBTASK —
TECHNICAL CREW C Maxeiner / D Davenport
DATE JUN 28 30 87 FORM COMPLETED BY CM2/DD

WEATHER SUNNY LEVEL OF PROTECTION A B C (D) *
MEASURING POINT Top of Riser METHOD OF MEASUREMENT EWI
MEASURING POINT ELEV. ____ INITIAL WATER LEVEL ELEV. ____

SAMPLING METHOD Teflon Bailer INITIAL WATER LEVEL 73'4'4"
SPECIAL SAMPLING METHODS ____
TIME ELAPSED/FINAL DEVELOPMENT/PURGING ½ Hours TECHNICIAN CM
SAMPLING DEPTH INTERVAL Top of H2O-73' PUMPING RATE/SAMPLING —

WATER QUALITY INSTRUMENTS USED	SERIAL NO.	CALIBRATION REFERENCE
1. Orion 210 ph meter	2210	see Orion 210 ph meter Calibration logbook 14
2. YSI S-C-T meter	12911	see YSI S-C-T meter Calibration logbook 13
3. YSI Dissolved oxygen meter	2992	see YSI D.O. meter Calibration logbook 15
4.		
5.		

FINAL WATER QUALITY INSTRUMENT READINGS

TEMP (°C) 13.2
CONDUCTIVITY (umhos/cm) 74x10¹
PH 7.21
EH 227
D.O. (mg/l) 5.59
OTHER ____

DUPLICATE WATER SAMPLING DATA INSTRUMENT READINGS

TEMP (°C) 13.0
CONDUCTIVITY (umhos/cm) 72x10¹
PH 7.23
EH 205
D.O. (mg/l) 5.83

TECHNICIAN CM TIME START 2030 TIME FINISH 2155

SAMPLE COLLECTION PERIOD: START 2030 STOP 2155 TECHNICIAN CM2/DD

*NOTE: FOR LEVELS OF PROTECTION; SEE SITE SPECIFIC SAFETY PLAN FOR DETAILS.

SERIAL NO. WS _____
PAGE __ OF __

TOTAL VOLUME WATER COLLECTED _____ TOTAL NO. OF CONTAINERS 7
FIELD FILTERED: YES ✓ NO: __ TIME 2100 TECH. CM FILTER TYPE BARREL
SAMPLES COOLED DURING COLLECTION PERIOD: YES ✓ NO: __

SAMPLE CONTAINERS

QUANTITY	CONTAINER MATERIAL	SAMPLE LABEL SERIAL NO.	PRESERVATIVES	COMMENTS
40ML	GLASS	SL00063	ICE	VOA
40ML	↓	64	↓	VOA
1/2 GAL	↓	65	↓	BNA
1/2 GAL	↓	66	↓	BNA
1L	PLASTIC	67	HNO3	TOT METALS
1L	↓	68	HNO3	DISS METALS
1 GAL	↓	69	ICE	PREFILTRATION

DOCUMENTATION

SAMPLE CONTAINERS SEALED: YES __ NO ✓ TIME _____ TECHNICIAN _____
SAMPLE SHIPPING CONTAINER SEALED & PACKED: YES ✓ NO __ TIME Jul 2 0100 TECH. CM
LAB ANALYSIS REQUEST FORM: YES ✓ NO __ TIME Jul 2 0100 SERIAL NO. LAB 2999 TECH. CM
CHAIN OF CUSTODY FORM: YES ✓ NO __ TIME Jul 2 0100 SERIAL NO. 2999 3000 TECH. CM

COMMENTS: _____

WELL DEVELOPMENT & PURGING
WATER QUALITY/WATER REMOVAL

SERIAL NO. WD 00021
PAGE ___ OF ___

PROJECT NAME: Morrison ph 1 R.I
PROJECT NO. 12872832
DATE JUN 28 '91
BORING/WELL NO. G102D
MAJOR TASK 2294 SUBTASK —
FORM COMPLETED BY CM2/DD

WATER QUALITY INSTRUMENTS

DATE	INSTRUMENT	SERIAL NO.	CALIBRATION PERFORMED (✓)	TECHNICIAN
6/28	Orion 210 ph meter	2210	✓	C Maxeiner
6/28	YSI S-C-T meter	12911	✓	C Maxeiner
6/29	Orion 210 ph meter	2210	✓	C Maxeiner
6/29	YSI S-C-T meter	12911	✓	C Maxeiner
6/30	Orion 210 ph meter	2210	✓	D Davenport
6/30	YSI S-C-T meter	12911	✓	D Davenport

WATER QUALITY READINGS

DATE	TIME	TOTAL GALLONS REMOVED	TOTAL WELL VOLUMES REMOVED	TEMP. (°C)	DISSOLVED OXYGEN MG/L	pH	REDOX (EH) MV	CONDUCTIVITY UMHOS/CM	APPEARANCE	COMMENTS
6/28	1314	8.5		14.1		7.07		76x10	MUDDY	
6/29	1930	6		13.0		7.12		72x10	Cloudy - light TAN	
6/30	2015	9		13.0		7.20		74x10	CLEAR	

NOTES:

1. COMMENTS SHOULD DELINEATE FINAL SAMPLE AND REPLICATE MEASUREMENTS.
2. ANY INSTRUMENTATION CALIBRATION OR USE ANOMALIES SHOULD BE NOTED.
3. APPEARANCE SHOULD BE NOTED BEFORE, DURING, AND AFTER DEVELOPMENT.

PUMPING TECHNIQUES

DATE	PUMP TYPE	SERIAL NO.	PUMP TECHNICIAN

WATER REMOVAL DATA

DATE	PUMP ON	PUMP OFF	PUMPING RATE (GPM)	INCREMENTAL GALLONS REMOVED	TOTAL GALLONS REMOVED	INCREMENTAL WELL VOLUMES REMOVED	TOTAL WELL VOLUMES REMOVED	PUMP INTAKE LEVEL	WATER LEVEL BEFORE PUMPING	WATER LEVEL AFTER PUMPING	COMMENTS
											N/A

SAMPLE CONTROL SHEET

SERIAL NO. SCS 00011
PAGE __ OF __

PROJECT NAME Morrison Pt 1 RI
PROJECT NO. 12872832
SAMPLE LOCATION NO. G102D

DATE Jun 30 '87
SAMPLER CAL
CUSTODIAN Con

SAMPLE NO.	SAMPLE LABEL NO.	C.O.C. NO.	SHIPPED	LAB ANALYSIS REQUEST NO.
VOA	SL00063	2999 / 3000	Jul 2 '87	LAR2999
VOA	64	↓	↓	↓
BNA	65	↓	↓	↓
BNA	66	↓	↓	↓
Tot Metals	67	↓	↓	↓
Dis Metals	68	↓	↓	↓
DI Filtration	69	↓	↓	↓

WATER SAMPLING DATA

SERIAL NO. WS 0010
PAGE __ OF __

PROJECT NAME Morrison ph 1 R.I.
SAMPLE LOCATION NO. OR BORING/WELL NO. G104(i)
PROJECT NO. 12872832
MAJOR TASK ~~2293~~ 2294 SUBTASK —
TECHNICAL CREW G. Maxeiner / D. Davenport
DATE JUN 27 87
FORM COMPLETED BY CM²/DP

WEATHER Sunny (Cool) LEVEL OF PROTECTION A B C (D) *
MEASURING POINT Top of Riser METHOD OF MEASUREMENT EWI
MEASURING POINT ELEV. _____ INITIAL WATER LEVEL ELEV. _____

SAMPLING METHOD Teflon Bailer INITIAL WATER LEVEL 9.1'
SPECIAL SAMPLING METHODS _____
TIME ELAPSED/FINAL DEVELOPMENT/PURGING 30 min TECHNICIAN CM
SAMPLING DEPTH INTERVAL Full well PUMPING RATE/SAMPLING —

WATER QUALITY INSTRUMENTS USED	SERIAL NO.	CALIBRATION REFERENCE
1. Orion 210 ph meter	2210	see-Orion 210 ph meter Calibration logbook
2. YSI S-C-T meter	12911	see-YSI S-C-T meter Calibration logbook
3. YSI Dissolved Oxygen meter	2992	see-YSI D.O. meter Calibration logbook
4.		
5.		

FINAL WATER QUALITY INSTRUMENT READINGS

TEMP (°C) 13.8
CONDUCTIVITY (umhos/cm) 72 x 10'
PH 7.10
EH 224
D.O. (mg/l) 8.47
OTHER _____

DUPLICATE WATER SAMPLING DATA INSTRUMENT READINGS

TEMP (°C) 13.2
CONDUCTIVITY (umhos/cm) 72x10'
PH 7.11
EH 224
D.O. (mg/l) 7.79

TECHNICIAN CM² TIME START 1945 TIME FINISH 1955

SAMPLE COLLECTION PERIOD: START 1945 STOP 1955 TECHNICIAN CM²

*NOTE: FOR LEVELS OF PROTECTION; SEE SITE SPECIFIC SAFETY PLAN FOR DETAILS.

SERIAL NO. WS _____
PAGE __ OF __

TOTAL VOLUME WATER COLLECTED _____ TOTAL NO. OF CONTAINERS 7
FIELD FILTERED: YES ✓ NO __ TIME 1955 TECH. CAR FILTER TYPE BAV/CL
SAMPLES COOLED DURING COLLECTION PERIOD: YES ✓ NO __

SAMPLE CONTAINERS

QUANTITY	CONTAINER MATERIAL	SAMPLE LABEL SERIAL NO.	PRESERVATIVES	COMMENTS
40 ML	GLASS	SC000 27	—	VOA
40 ML	"	28	—	VOA
½ GAL	"	29	—	BNA
½ GAL	"	30	—	BNA
1L.	PLASTIC	31	HNO3	METALS - TOTAL
1L.	"	32	HNO3	METALS - DISS
1GAL	"	33	—	PREFILTRATION

DOCUMENTATION

SAMPLE CONTAINERS SEALED: YES __ NO ✓ TIME _____ TECHNICIAN _____
SAMPLE SHIPPING CONTAINER SEALED & PACKED: YES ✓ NO __ TIME 2300 TECH CAR
LAB ANALYSIS REQUEST FORM: YES ✓ NO __ TIME 2300 SERIAL NO. CAR 2735 TECH. CAR
CHAIN OF CUSTODY FORM: YES ✓ NO __ TIME 2300 SERIAL NO. 2735 2736 TECH. CAR

COMMENTS: _____

WELL DEVELOPMENT & PURGING
WATER QUALITY/WATER REMOVAL

SERIAL NO. WD 00010
PAGE ___ OF ___

PROJECT NAME Morrison ph 1 R.I.
PROJECT NO. 12872832
DATE SUN 27 '81 FORM COMPLETED BY CMR/DD

BORING/WELL NO. 6104D
MAJOR TASK ~~2293~~ 2294 SUBTASK —

WATER QUALITY INSTRUMENTS

DATE	INSTRUMENT	SERIAL NO.	CALIBRATION PERFORMED (✓)	TECHNICIAN
6/27	Orion 210 ph meter	2210	✓	C. Maxeiner
6/27	YSI S-C-T meter	12911	✓	C. Maxeiner

WATER QUALITY READINGS

DATE	TIME	TOTAL GALLONS REMOVED	TOTAL WELL VOLUMES REMOVED	TEMP. (°C)	DISSOLVED OXYGEN MG/L	pH	REDOX (EH) MV	CONDUCTIVITY UMHOS/CM	APPEARANCE	COMMENTS
6/27	1658	25		13.8		7.07		12410	Clear	
6/27	1800	85		13.6		7.11		12400		807 TEFLON
6/27	1830	90		13.2		7.13		12400		TEFLON
	1940	110								

NOTES:
1. COMMENTS SHOULD DELINEATE FINAL SAMPLE AND REPLICATE MEASUREMENTS.
2. ANY INSTRUMENTATION CALIBRATION OR USE ANOMALIES SHOULD BE NOTED.
3. APPEARANCE SHOULD BE NOTED BEFORE, DURING, AND AFTER DEVELOPMENT.

PUMPING TECHNIQUES

DATE	PUMP TYPE	SERIAL NO.	PUMP TECHNICIAN
6/27	CONTRACTOR	—	CM —

WATER REMOVAL DATA

DATE	PUMP ON	PUMP OFF	PUMPING RATE (GPM)	INCREMENTAL GALLONS REMOVED	TOTAL GALLONS REMOVED	INCREMENTAL WELL VOLUMES REMOVED	TOTAL WELL VOLUMES REMOVED	PUMP INTAKE LEVEL	WATER LEVEL BEFORE PUMPING	WATER LEVEL AFTER PUMPING	COMMENTS
6/27	1650	1658	11.3						9'	9'	

WELL DEVELOPMENT & PURGING
GENERAL DATA

SERIAL NO. WDG 00010
PAGE OF

PROJECT NAME Morrison ph 1 RI
PROJECT NO. 12872832
DATE JUN 27 '87 FORM COMPLETED BY CAT/DD

BORING/WELL NO. 6104D
MAJOR TASK 2294 SUBTASK —

WELL CONSTRUCTION

TOTAL DEPTH (FT) 51.13'
GRAVEL PACK INTERVAL (FT) _____
WELL PROTECTOR: YES ✓ NO ___
FLUID INJECTED DURING DRILLING (QUANTITY) AIR

BOREHOLE DIAMETER 6"
WELL DIAMETER (ID)(IN) 2"
PADLOCK NO. N/A

WATER VOLUME DATA

DATE OF MEASUREMENT JUN 27 '87
MEASURING POINT Top of Riser
WATER LEVEL INSTRUMENT USED EWI
INTIAL WATER LEVEL (FT) 9'1"
LINEAR FEET OF WATER 40'
LINEAR FEET SATURATED GRAVEL PACK 17.5'

WATER VOLUMES		
ITEM	VOLUME FT^3	VOLUME GALS
WELL CASING		30.12
GRAVEL PACK		6.53
DRILLING FLUIDS	0	2
		36.53

NOTE: QUANTITIES CALCULATED PRIOR TO DEVELOPMENT

DEVELOPMENT CRITERIA

METHOD OF DEVELOPMENT Contractors pump, Teflon Bailer
WATER QUALITY MEASUREMENTS: YES ✓ NO ___
WATER VOLUME TO BE REMOVED (GALS) 36.5 MINIMUM 55 MAXIMUM 110

NOTE: DEVELOPMENT TO BE PERFORMED IN ACCORDANCE WITH PROJECT SPECIFIC WELL DEVELOPMENT PLAN.

COMMENTS

SAMPLE CONTROL SHEET

SERIAL NO. SCS 00002
PAGE __ OF __

PROJECT NAME Morrison PH 1 RI
PROJECT NO. 12522232
SAMPLE LOCATION NO. G1045

DATE Jun 27 '87
SAMPLER CMR
CUSTODIAN CMR

SAMPLE NO.	SAMPLE LABEL NO.	C.O.C. NO.	SHIPPED	LAB ANALYSIS REQUEST NO.
VOA	SL000 20	2665	Jun 29 '87	LAR 2665
VOA	21	↓	↓	↓
BNA	22			
BNA	23			
METALS-TOTAL	24			
METALS-DISS	25			
Prefiltration	26			

WELL DEVELOPMENT & PURGING
WATER QUALITY/WATER REMOVAL

SERIAL NO. WD 00009
PAGE ___ OF ___

PROJECT NAME Morrison ph 1 RI
PROJECT NO. 12872832
DATE JUN 20 '87 FORM COMPLETED BY CM²/DD

BORING/WELL NO. G104S
MAJOR TASK ~~2292~~ 2294 SUBTASK —

WATER QUALITY INSTRUMENTS

DATE	INSTRUMENT	SERIAL NO.	CALIBRATION PERFORMED (✓)	TECHNICIAN
6/20	Orion 210 ph meter	2210	✓	D Davenport
6/20	YSI S-C-T meter	12911	✓	D Davenport

WATER QUALITY READINGS

DATE	TIME	TOTAL GALLONS REMOVED	TOTAL WELL VOLUMES REMOVED	TEMP. (°C)	DISSOLVED OXYGEN MG/L	PH	REDOX (EH) MV	CONDUCTIVITY UMHOS/CM	APPEARANCE	COMMENTS
6/20	1550	80		12.8		7.02		80x10'	~~ver~~ ←	very SILTY
6/20	1612	90		13.1		7.03		82x10'	←	very SILTY
6/20	1629	100		13.1		6.99		82x10	←	"

OTES:

1. COMMENTS SHOULD DELINEATE FINAL SAMPLE AND REPLICATE MEASUREMENTS.
2. ANY INSTRUMENTATION CALIBRATION OR USE ANOMALIES SHOULD BE NOTED.
3. APPEARANCE SHOULD BE NOTED BEFORE, DURING, AND AFTER DEVELOPMENT.

PUMPING TECHNIQUES

DATE	PUMP TYPE	SERIAL NO.	PUMP TECHNICIAN
6/20	Contractors pump	—	CMC

WATER REMOVAL DATA

DATE	PUMP ON	PUMP OFF	PUMPING RATE (GPM)	INCREMENTAL GALLONS REMOVED	TOTAL GALLONS REMOVED	INCREMENTAL WELL VOLUMES REMOVED	TOTAL WELL VOLUMES REMOVED	PUMP INTAKE LEVEL	WATER LEVEL BEFORE PUMPING	WATER LEVEL AFTER PUMPING	COMMENTS
4/20	1500	1515	15gpm						6'	6'	65.

WELL DEVELOPMENT & PURGING
GENERAL DATA

SERIAL NO. WDG 00009
PAGE OF

PROJECT NAME Morrison ph 1 RI
PROJECT NO. 12872832
DATE JUN 20 '87 FORM COMPLETED BY CM2/DD
BORING/WELL NO. G 1045
MAJOR TASK 2294 SUBTASK —

WELL CONSTRUCTION

TOTAL DEPTH (FT) 17' 8"
GRAVEL PACK INTERVAL (FT) 8"
WELL PROTECTOR: YES ✓ NO ___
FLUID INJECTED DURING DRILLING (QUANTITY) Air
BOREHOLE DIAMETER 8"
WELL DIAMETER (ID)(IN) 2"
PADLOCK NO. N/A

WATER VOLUME DATA

DATE OF MEASUREMENT JUN 20 '87
MEASURING POINT Top of Riser
WATER LEVEL INSTRUMENT USED EWI
INTIAL WATER LEVEL (FT) 9' 10"
LINEAR FEET OF WATER ~8.0'
LINEAR FEET SATURATED GRAVEL PACK ~~8.0'~~ ~16'

WATER VOLUMES		
ITEM	VOLUME	
	FT^3	GALS
WELL CASING		1.31
GRAVEL PACK		27.54
DRILLING FLUIDS	0	0

NOTE: *QUANTITIES CALCULATED PRIOR TO DEVELOPMENT*

DEVELOPMENT CRITERIA

METHOD OF DEVELOPMENT Contractors pump -75 gallons, Teflon bailer - 25 gallons
WATER QUALITY MEASUREMENTS: YES ✓ NO ___
WATER VOLUME TO BE REMOVED (GALS) 29 (1 vol) MINIMUM 43 MAXIMUM 87 x5 = 145

NOTE: DEVELOPMENT TO BE PERFORMED IN ACCORDANCE WITH PROJECT SPECIFIC WELL DEVELOPMENT PLAN.

COMMENTS

SAMPLE CONTROL SHEET

SERIAL NO. SCS 00003
PAGE ___ OF ___

PROJECT NAME Morrison Pt. Ri
PROJECT NO. 12872032
SAMPLE LOCATION NO. G104D

DATE Jun 22 '87
SAMPLER Cur
CUSTODIAN Cur

SAMPLE NO.	SAMPLE LABEL NO.	C.O.C. NO.	SHIPPED	LAB ANALYSIS REQUEST NO.
VOA	Sl000 27	2735	JUN ~~29~~ 30 -87	LAR 2735
VOA	28	↓	↓	
BNA	29	↓	↓	
BNA	30	↓	↓	
METALS-TOTAL	31	↓	↓	
METALS-DISS	32	↓	↓	
Prefiltration	33	↓	↓	

WELL DEVELOPMENT & PURGING
GENERAL DATA

SERIAL NO. WDG
PAGE OF 00019

PROJECT NAME Morrison ph 1 RI
PROJECT NO. 12872832
DATE JUN 28 '87 FORM COMPLETED BY CAR/OD

BORING/WELL NO. G105S
MAJOR TASK 2294 SUBTASK —

WELL CONSTRUCTION

TOTAL DEPTH (FT) 23.7 + 24.9'
GRAVEL PACK INTERVAL (FT) 23.0 - 7.0'
WELL PROTECTOR: YES ✓ NO ___
FLUID INJECTED DURING DRILLING (QUANTITY) AIR

BOREHOLE DIAMETER 10"
WELL DIAMETER (ID)(IN) 2"
PADLOCK NO. N/A

WATER VOLUME DATA

DATE OF MEASUREMENT Jun 28'87
MEASURING POINT TOR
WATER LEVEL INSTRUMENT USED Ewi
INTIAL WATER LEVEL (FT) 12'11 3/4
LINEAR FEET OF WATER 11'
LINEAR FEET SATURATED GRAVEL PACK 11'

WATER VOLUMES		
ITEM	VOLUME	
	FT^3	GALS
WELL CASING		1.8
GRAVEL PACK		18.9
DRILLING FLUIDS	∅	∅

1 vol 20.7

NOTE: QUANTITIES CALCULATED PRIOR TO DEVELOPMENT

DEVELOPMENT CRITERIA

METHOD OF DEVELOPMENT Teflon Bailer
WATER QUALITY MEASUREMENTS: YES ✓ NO ___
WATER VOLUME TO BE REMOVED (GALS) 20.7 MINIMUM 31.0 MAXIMUM 62.1

NOTE: DEVELOPMENT TO BE PERFORMED IN ACCORDANCE WITH PROJECT SPECIFIC WELL DEVELOPMENT PLAN.

COMMENTS

WELL DEVELOPMENT & PURGING
WATER QUALITY/WATER REMOVAL

SERIAL NO. WD ~~0001~~ 9
PAGE ___ OF ___

PROJECT NAME Morrison ph 1 RI
PROJECT NO. 12872832
DATE JUN 28-30 '87
BORING/WELL NO. G105S
MAJOR TASK 2294 SUBTASK —
FORM COMPLETED BY Cruz/DD.

WATER QUALITY INSTRUMENTS

DATE	INSTRUMENT	SERIAL NO.	CALIBRATION PERFORMED (✓)	TECHNICIAN
6/28-30/87	Orion 210 ph meter	2210	✓	Cruz
6/28-30/87	YSI S-C-T meter	12911	✓	Cruz
6/28-30	YSI ~~Dissolved Oxygen meter~~ DO	~~2992~~ DO		

WATER QUALITY READINGS

DATE	TIME	TOTAL GALLONS REMOVED	TOTAL WELL VOLUMES REMOVED	TEMP. (°C)	DISSOLVED OXYGEN MG/L	pH	REDOX (EH) MV	CONDUCTIVITY UMHOS/CM	APPEARANCE	COMMENTS
6/28	1[illegible]0	5							Sl. cldy	Dry
6/29	1500	5		14.9		6.86		[illegible]x10³	↓	
6/30	2349	5		13.0		7.07		455x10³	↓	

NOTES:

1. COMMENTS SHOULD DELINEATE FINAL SAMPLE AND REPLICATE MEASUREMENTS.
2. ANY INSTRUMENTATION CALIBRATION OR USE ANOMALIES SHOULD BE NOTED.
3. APPEARANCE SHOULD BE NOTED BEFORE, DURING, AND AFTER DEVELOPMENT.

PUMPING TECHNIQUES

DATE	PUMP TYPE	SERIAL NO.	PUMP TECHNICIAN

WATER REMOVAL DATA

DATE	PUMP ON	PUMP OFF	PUMPING RATE (GPM)	INCREMENTAL GALLONS REMOVED	TOTAL GALLONS REMOVED	INCREMENTAL WELL VOLUMES REMOVED	TOTAL WELL VOLUMES REMOVED	PUMP INTAKE LEVEL	WATER LEVEL BEFORE PUMPING	WATER LEVEL AFTER PUMPING	COMMENTS
											N/A

JOHN MATHES & ASSOCIATES, INC.

GEOLOGIC DRILLING COMMENTS

BORING NO. G105S JMA PROJECT NO. 12872832 DATE 6-22-87

REMARK NO.	REMARKS
1	Encountered h20 @ 11.0'
2	Driller indicating blowin on top of bit
3	Pulled rods out @ 20', hole collapsed to 8.0' started new hole 3.0' N
4	In new hole G105S installed 22' of 8" casing to hold hole open. Continued to advance hole
5	@ 53.0' still in silty sand (no rock) decision to install well; backfill to 23.0'. Pulled rods; hole collapsed to 23.0'

WATER LEVELS

REFERENCE POINT	DATE	TIME	DEPTH (FT.)	COMMENTS	TECH.
Ground Surface	6-22-87	0840	11.0	During Drilling	CM

WATER SAMPLING DATA

SERIAL NO. WS - 00019
PAGE __ OF __

PROJECT NAME Morrison ph 1 R.I
SAMPLE LOCATION NO. OR BORING/WELL NO. G105S
PROJECT NO. 12872832
MAJOR TASK 2294 2294 SUBTASK —
TECHNICAL CREW C Mariner / D Davenport
DATE JUN '87
FORM COMPLETED BY CM2/DD

WEATHER Sunny
LEVEL OF PROTECTION A B C (D) *
MEASURING POINT TOR
METHOD OF MEASUREMENT E w/
MEASURING POINT ELEV. _____
INITIAL WATER LEVEL ELEV. _____

SAMPLING METHOD Teflon Bailer ↓
INITIAL WATER LEVEL 13' 1 1/2"
SPECIAL SAMPLING METHODS _____
TIME ELAPSED/FINAL DEVELOPMENT/PURGING 16 hrs.
TECHNICIAN CM
SAMPLING DEPTH INTERVAL TOTAL
PUMPING RATE/SAMPLING —

WATER QUALITY INSTRUMENTS USED	SERIAL NO.	CALIBRATION REFERENCE
1. Orion 210 ph meter	2210	see Orion 210 ph meter Calibration logbook 14
2. YSI S-C-T meter	12911	see YSI S-C-T meter Calibration logbook 13
3. YSI Dissolved Oxygen meter	2992	see YSI D.O. meter Calibration logbook 15
4.		
5.		

FINAL WATER QUALITY INSTRUMENT READINGS

TEMP (°C) 14.2
CONDUCTIVITY (umhos/cm) 162 x 10
PH 6.87
EH 208
D.O. (mg/l) 4.45
OTHER _____

DUPLICATE WATER SAMPLING DATA INSTRUMENT READINGS

TEMP (°C) _____
CONDUCTIVITY (umhos/cm) _____
PH _____
EH _____
D.O. (mg/l) _____
_____

TECHNICIAN CM TIME START 1600 TIME FINISH 1620

SAMPLE COLLECTION PERIOD: START 1510 STOP 1620 TECHNICIAN CM2/DD

*NOTE: FOR LEVELS OF PROTECTION; SEE SITE SPECIFIC SAFETY PLAN FOR DETAILS.

SERIAL NO. WS _____
PAGE __ OF __

TOTAL VOLUME WATER COLLECTED _____ TOTAL NO. OF CONTAINERS 7
FIELD FILTERED: YES ✓ NO __ TIME 1600 TECH. CMT FILTER TYPE BARRCI
SAMPLES COOLED DURING COLLECTION PERIOD: YES ✓ NO __

SAMPLE CONTAINERS

QUANTITY	CONTAINER MATERIAL	SAMPLE LABEL SERIAL NO.	PRESERVATIVES	COMMENTS
~~Amber~~	GLASS	SL00054	ICE	VOA
40ML	↓	55	↓	VOA
½ GAL		56		BNA
½ GAL	↓	57	↓	BNA
1L	PLASTIC	58	HNO_3	TOT METALS
1L	↓	59	HNO_3	DISS METALS
1 GAL	↓	60	ICE	PREFILTRATION

DOCUMENTATION

SAMPLE CONTAINERS SEALED: YES __ NO ✓ TIME _____ TECHNICIAN _____
SAMPLE SHIPPING CONTAINER SEALED & PACKED: YES ✓ NO __ TIME 7/2/87 0100 TECH. CMT
LAB ANALYSIS REQUEST FORM: YES ✓ NO __ TIME 7/2/87 0800 SERIAL NO. LAR 273 TECH. CMT
CHAIN OF CUSTODY FORM: YES ✓ NO __ TIME 7/2 0100 SERIAL NO. 2731 2732 TECH. CMT

COMMENTS: _____

SAMPLE CONTROL SHEET

SERIAL NO. SCS 00009
PAGE __ OF __

PROJECT NAME Morrison pit IRI
PROJECT NO. 12872832
SAMPLE LOCATION NO. G105S

DATE 4 Jul 7 '87
SAMPLER Cole
CUSTODIAN Cole

SAMPLE NO.	SAMPLE LABEL NO.	C.O.C. NO.	SHIPPED	LAB ANALYSIS REQUEST NO.
VOA	SC000 54	2731	Jul 2 '87	LAR 2731
VOA	55	↓	↓	↓
BNA	56			
BNA	57			
TOT METAL	58			
DIS METAL	59			
PREFILTRATION	60			

WELL DEVELOPMENT & PURGING
GENERAL DATA

SERIAL NO. WDG 00031
PAGE OF

PROJECT NAME Morrison ph 1 RI
PROJECT NO. 12812832
DATE JUN 28 81 / 30
BORING/WELL NO. G-105D
MAJOR TASK ~~2893~~ 2294 / 50 SUBTASK —
FORM COMPLETED BY CMT/DD

WELL CONSTRUCTION

TOTAL DEPTH (FT) 50.4'
GRAVEL PACK INTERVAL (FT) 46-32
WELL PROTECTOR: YES ✓ NO ___
FLUID INJECTED DURING DRILLING (QUANTITY) ___
BOREHOLE DIAMETER 6"
WELL DIAMETER (ID)(IN) 2"
PADLOCK NO. N/A

WATER VOLUME DATA

DATE OF MEASUREMENT JUN 28 '81
MEASURING POINT TOP OF Riser
WATER LEVEL INSTRUMENT USED EWI
INTIAL WATER LEVEL (FT) 22' 7¼"
LINEAR FEET OF WATER 27.7'
LINEAR FEET SATURATED GRAVEL PACK 14'

WATER VOLUMES		
ITEM	VOLUME	
	FT^3	GALS
WELL CASING		4.52
GRAVEL PACK		7.65
DRILLING FLUIDS		

1 Vol = 12.17

NOTE: QUANTITIES CALCULATED PRIOR TO DEVELOPMENT

DEVELOPMENT CRITERIA

METHOD OF DEVELOPMENT Well Wizard
WATER QUALITY MEASUREMENTS: YES ✓ NO ___
WATER VOLUME TO BE REMOVED (GALS) 12.17 MINIMUM 18.3 MAXIMUM 36.51

NOTE: DEVELOPMENT TO BE PERFORMED IN ACCORDANCE WITH PROJECT SPECIFIC WELL DEVELOPMENT PLAN.

COMMENTS

WELL DEVELOPMENT & PURGING
WATER QUALITY/WATER REMOVAL

SERIAL NO. WD 00031
PAGE ___ OF ___

PROJECT NAME Morrison ph 1 RI
PROJECT NO. 12872832
DATE JUN 28 87 FORM COMPLETED BY CM²/DD

BORING/WELL NO. G105D
MAJOR TASK 2843 2844 SUBTASK ___
DD

WATER QUALITY INSTRUMENTS

DATE	INSTRUMENT	SERIAL NO.	CALIBRATION PERFORMED (✓)	TECHNICIAN
6/28	ORION 210 ph meter	2210	✓	C Maxeiner
6/28	YSI S-C-T meter	12911	✓	C Maxeiner

WATER QUALITY READINGS

DATE	TIME	TOTAL GALLONS REMOVED	TOTAL WELL VOLUMES REMOVED	TEMP. (°C)	DISSOLVED OXYGEN MG/L	pH	REDOX (EH) MV	CONDUCTIVITY UMHOS/CM	APPEARANCE	COMMENTS
6/28	1824	310		18.2		7.12		79x10	Muddy to Cloudy	Clearing after 30 gallons
6/28	1830	41		18.2		7.14		78x10	CLEAR	

NOTES:

1. COMMENTS SHOULD DELINEATE FINAL SAMPLE AND REPLICATE MEASUREMENTS.
2. ANY INSTRUMENTATION CALIBRATION OR USE ANOMALIES SHOULD BE NOTED.
3. APPEARANCE SHOULD BE NOTED BEFORE, DURING, AND AFTER DEVELOPMENT.

PUMPING TECHNIQUES

DATE	PUMP TYPE	SERIAL NO.	PUMP TECHNICIAN
6/30	WELL WIZARD	-	CM

WATER REMOVAL DATA

DATE	PUMP ON	PUMP OFF	PUMPING RATE (GPM)	INCREMENTAL GALLONS REMOVED	TOTAL GALLONS REMOVED	INCREMENTAL WELL VOLUMES REMOVED	TOTAL WELL VOLUMES REMOVED	PUMP INTAKE LEVEL	WATER LEVEL BEFORE PUMPING	WATER LEVEL AFTER PUMPING	COMMENTS
6/30	1630	1925	.25						22'	22'	

WATER SAMPLING DATA

SERIAL NO. WS ~~00031~~
PAGE __ OF __

PROJECT NAME Morrison ph 1 RI
SAMPLE LOCATION NO. OR BORING/WELL NO. G105D
PROJECT NO. 12872832
MAJOR TASK ~~2293~~ 2294 SUBTASK —
TECHNICAL CREW C Maxeiner / D Davenport
DATE JUN 28 '97
FORM COMPLETED BY CM2/DD

WEATHER Sunny
LEVEL OF PROTECTION A B C (D) *
MEASURING POINT Top of Riser
METHOD OF MEASUREMENT EWI
MEASURING POINT ELEV. ____
INITIAL WATER LEVEL ELEV. ____

SAMPLING METHOD Well Wizard
INITIAL WATER LEVEL 22' 7¼"
SPECIAL SAMPLING METHODS ____
TIME ELAPSED/FINAL DEVELOPMENT/PURGING 5 Min
TECHNICIAN CM2
SAMPLING DEPTH INTERVAL 35'
PUMPING RATE/SAMPLING .25 gpm

WATER QUALITY INSTRUMENTS USED	SERIAL NO.	CALIBRATION REFERENCE
1. Orion 210 ph meter	2210	see Orion 210 ph meter Calibration logbook 14
2. YSI S-C-T meter	12911	see YSI S-C-T meter Calibration logbook 13
3. YSI Dissolved meter	2992	see YSI D.O. meter Calibration logbook 15
4.		
5.		

FINAL WATER QUALITY INSTRUMENT READINGS

TEMP (°C) 18.2
CONDUCTIVITY (umhos/cm) 77 x 10'
PH 7.13
EH 221
D.O. (mg/l) 4.33
OTHER ____

DUPLICATE WATER SAMPLING DATA INSTRUMENT READINGS

TEMP (°C) 19.9
CONDUCTIVITY (umhos/cm) 80x10'
PH 7.09
EH 217
D.O. (mg/l) 3.70

TECHNICIAN CM2 TIME START 1840 TIME FINISH 1915

SAMPLE COLLECTION PERIOD: START 1840 STOP ~~1925~~ 1915 CM2 TECHNICIAN CM2

*NOTE: FOR LEVELS OF PROTECTION; SEE SITE SPECIFIC SAFETY PLAN FOR DETAILS.

SERIAL NO. WS _____
PAGE __ OF __

TOTAL VOLUME WATER COLLECTED _____ TOTAL NO. OF CONTAINERS 7
FIELD FILTERED: YES ✓ NO __ TIME 1900 TECH. CMZ FILTER TYPE BARREL
SAMPLES COOLED DURING COLLECTION PERIOD: YES ✓ NO __

SAMPLE CONTAINERS

QUANTITY	CONTAINER MATERIAL	SAMPLE LABEL SERIAL NO.	PRESERVATIVES	COMMENTS
40ML	GLASS	SL000 94	—	VOA
40ML	↓	95	—	VOA
½ GAL		96	—	BNA
½ GAL	↓	97	—	BNA
1L	PLASTIC	98	HNO_3	METALS - TOTAL
1L	↓	99	HNO_3	METALS - DIS
1 GAL	↓	90	—	PREFILTRATION

DOCUMENTATION

SAMPLE CONTAINERS SEALED: YES __ NO ✓ TIME _____ TECHNICIAN _____
SAMPLE SHIPPING CONTAINER SEALED & PACKED: YES ✓ NO __ TIME 0900 TECH. CMZ
LAB ANALYSIS REQUEST FORM: YES ✓ NO __ TIME 0100 SERIAL NO. 2733 TECH. CMZ
CHAIN OF CUSTODY FORM: YES ✓ NO __ TIME 0100 SERIAL NO. 2733 2734 TECH. CMZ

COMMENTS: _____

WELL DEVELOPMENT & PURGING
GENERAL DATA

SERIAL NO. WDG
PAGE OF 00032

PROJECT NAME Morrison ph 1 RI
PROJECT NO. 12812832
DATE SUN 28 '87 FORM COMPLETED BY CM2/DO

BORING/WELL NO. G105D DUP
MAJOR TASK 2294.00 SUBTASK —

WELL CONSTRUCTION

TOTAL DEPTH (FT) 50.4'
GRAVEL PACK INTERVAL (FT) 46-32
WELL PROTECTOR: YES ✓ NO ___
FLUID INJECTED DURING DRILLING (QUANTITY) ___

BOREHOLE DIAMETER 6"
WELL DIAMETER (ID)(IN) 2"
PADLOCK NO. N/A

WATER VOLUME DATA

DATE OF MEASUREMENT SUN 28 '87
MEASURING POINT Top of Riser
WATER LEVEL INSTRUMENT USED EWI
INTIAL WATER LEVEL (FT) 22' 7¼"
LINEAR FEET OF WATER 27.7'
LINEAR FEET SATURATED GRAVEL PACK 14'

WATER VOLUMES		
ITEM	VOLUME FT^3	VOLUME GALS
WELL CASING		
GRAVEL PACK		
DRILLING FLUIDS		

NOTE: QUANTITIES CALCULATED PRIOR TO DEVELOPMENT

DEVELOPMENT CRITERIA

METHOD OF DEVELOPMENT well wizard
WATER QUALITY MEASUREMENTS: YES ✓ NO ___
WATER VOLUME TO BE REMOVED (GALS) 12.2 MINIMUM 18.3 MAXIMUM 36.51

NOTE: DEVELOPMENT TO BE PERFORMED IN ACCORDANCE WITH PROJECT SPECIFIC WELL DEVELOPMENT PLAN.

COMMENTS

WELL DEVELOPMENT & PURGING
WATER QUALITY/WATER REMOVAL

SERIAL NO. WD - 00032
PAGE ___ OF ___

PROJECT NAME Morrison ph 1 RI
PROJECT NO. 12E72832
BORING/WELL NO. G105D Dup
MAJOR TASK 2294 SUBTASK —
DATE JUN 29 '87 FORM COMPLETED BY CMZ/DO

WATER QUALITY INSTRUMENTS

DATE	INSTRUMENT	SERIAL NO.	CALIBRATION PERFORMED (✓)	TECHNICIAN
6/28	Orion 210 ph meter	2210	✓	C Maxeiner
6/28	YSI S-C-T meter	12911	✓	C Maxeiner

WATER QUALITY READINGS

DATE	TIME	TOTAL GALLONS REMOVED	TOTAL WELL VOLUMES REMOVED	TEMP. (°C)	DISSOLVED OXYGEN MG/L	pH	REDOX (EH) MV	CONDUCTIVITY UMHOS/CM	APPEARANCE	COMMENTS
6/28	1824	36		18.2		7.12		79x10	Muddy to Cloudy	Clearing after 30 gallons
6/28	1830	41		13.2		7.14		78x10	CLEAR	

NOTES:

1. COMMENTS SHOULD DELINEATE FINAL SAMPLE AND REPLICATE MEASUREMENTS.
2. ANY INSTRUMENTATION CALIBRATION OR USE ANOMALIES SHOULD BE NOTED.
3. APPEARANCE SHOULD BE NOTED BEFORE, DURING, AND AFTER DEVELOPMENT.

PUMPING TECHNIQUES

DATE	PUMP TYPE	SERIAL NO.	PUMP TECHNICIAN
6/30	WELL WIZARD	—	CTZ

WATER REMOVAL DATA

DATE	PUMP ON	PUMP OFF	PUMPING RATE (GPM)	INCREMENTAL GALLONS REMOVED	TOTAL GALLONS REMOVED	INCREMENTAL WELL VOLUMES REMOVED	TOTAL WELL VOLUMES REMOVED	PUMP INTAKE LEVEL	WATER LEVEL BEFORE PUMPING	WATER LEVEL AFTER PUMPING	COMMENTS
6/30	1630	1925	025						22'	22	

WATER SAMPLING DATA

SERIAL NO. WS 00032
PAGE __ OF __

PROJECT NAME Morrison ph 1 RI
SAMPLE LOCATION NO. OR BORING/WELL NO. G105DDup
PROJECT NO. 1287 2832
MAJOR TASK 2295 SUBTASK —
TECHNICAL CREW C Mateiner / D Davenport
DATE JUN 28 '97
FORM COMPLETED BY CMZ/DD

WEATHER Sunny
LEVEL OF PROTECTION A B C (D) *
MEASURING POINT Top of Riser
METHOD OF MEASUREMENT EWI
MEASURING POINT ELEV. ____
INITIAL WATER LEVEL ELEV. ____

SAMPLING METHOD well wizard
INITIAL WATER LEVEL 22' 7¼"
SPECIAL SAMPLING METHODS ____
TIME ELAPSED/FINAL DEVELOPMENT/PURGING 5 MIN
TECHNICIAN CMZ
SAMPLING DEPTH INTERVAL 35'
PUMPING RATE/SAMPLING .25 gpm

WATER QUALITY INSTRUMENTS USED	SERIAL NO.	CALIBRATION REFERENCE	
1. Orion 210 ph meter	2210	see Orion 210 ph meter Calibration logbook	14
2. YSI S-C-T meter	12911	see YSI S-C-T meter Calibration logbook	13
3. YSI Dissolved Oxygen meter	2992	see YSI D.O. Meter Calibration logbook	15
4.			
5.			

FINAL WATER QUALITY INSTRUMENT READINGS

TEMP (°C) 18.1
CONDUCTIVITY (umhos/cm) 77 x10'
PH 7.14
EH 217
D.O. (mg/l) 4.53
OTHER ____

DUPLICATE WATER SAMPLING DATA INSTRUMENT READINGS

TEMP (°C) 18.3
CONDUCTIVITY (umhos/cm) 78 x10'
PH 7.15
EH 218
D.O. (mg/l) 4.49

TECHNICIAN CMZ TIME START 1850 TIME FINISH 1925

SAMPLE COLLECTION PERIOD: START 1850 STOP 1925 TECHNICIAN CMZ

*NOTE: FOR LEVELS OF PROTECTION; SEE SITE SPECIFIC SAFETY PLAN FOR DETAILS.

SERIAL NO. WS _____ -
PAGE __ OF __

TOTAL VOLUME WATER COLLECTED _____ TOTAL NO. OF CONTAINERS 7
FIELD FILTERED: YES ✓ NO __ TIME 1900 TECH. CM FILTER TYPE BARREL
SAMPLES COOLED DURING COLLECTION PERIOD: YES ✓ NO __

SAMPLE CONTAINERS

QUANTITY	CONTAINER MATERIAL	SAMPLE LABEL SERIAL NO.	PRESERVATIVES	COMMENTS
40ML	GLASS	SL00091	—	VOA
40ML	↓	92	—	VOA
½ GAL		93	—	BNA
½ GAL	↓	94	—	BNA
1L	PLASTIC	95	HNO_3	METALS - TOTAL
1L	↓	96	HNO_3	METALS - DIS
1 GAL	↓	97	—	PREFILTRATION

DOCUMENTATION

SAMPLE CONTAINERS SEALED: YES ~~✓~~ NO ✓ TIME _____ TECHNICIAN _____
SAMPLE SHIPPING CONTAINER SEALED & PACKED: YES ✓ NO __ TIME 0100 TECH. CM²
LAB ANALYSIS REQUEST FORM: YES ✓ NO __ TIME 0100 SERIAL NO. 2739 TECH. CM²
CHAIN OF CUSTODY FORM: YES ✓ NO __ TIME 0100 SERIAL NO. 2739 / 2740 TECH. CM²

COMMENTS: _____

SAMPLE CONTROL SHEET

SERIAL NO. SCS 00017
PAGE ___ OF ___

PROJECT NAME Morrison Pit 1 RI
PROJECT NO. 12B12832
SAMPLE LOCATION NO. G105D & DUP

DATE JUN30 '87
SAMPLER CMR
CUSTODIAN CMR

SAMPLE NO.	SAMPLE LABEL NO.	C.O.C. NO.	SHIPPED	LAB ANALYSIS REQUEST NO.
VOA	SL00084	2734	July 2 '87	LAR2733
VOA	85			
BNA	86			
BNA	87			
METALS-TOT	88			
METALS-DISV	89			
PREFILTRATION	90			
VOA	SL00091	2734	July 2 '87	LAR 2733
VOA	92			
BNA	93			
BNA	94			
METALS-TOT	95			
METALS-DIS	96			
PREFILTRATION	97			

WELL DEVELOPMENT & PURGING
GENERAL DATA

SERIAL NO. WDG 000 1
PAGE OF

PROJECT NAME Morrison ph 1 R.I
PROJECT NO. 12872832
DATE JUN 28 '87 FORM COMPLETED BY

BORING/WELL NO. G106D
MAJOR TASK ~~2294~~ 22945.55 SUBTASK — CM2/DD

WELL CONSTRUCTION

TOTAL DEPTH (FT) ~~24.6~~ 24.6
GRAVEL PACK INTERVAL (FT) 25.5 - 6.5'
WELL PROTECTOR: YES ✓ NO ___
FLUID INJECTED DURING DRILLING (QUANTITY) AIR

BOREHOLE DIAMETER 6"
WELL DIAMETER (ID)(IN) 2"
PADLOCK NO. N/A

WATER VOLUME DATA

DATE OF MEASUREMENT JUN 28 '87
MEASURING POINT TOR.
WATER LEVEL INSTRUMENT USED EWI
INTIAL WATER LEVEL (FT) 9' 5"
LINEAR FEET OF WATER 15.2
LINEAR FEET SATURATED GRAVEL PACK ~~16.40~~ 18.6

WATER VOLUMES		
ITEM	VOLUME	
	FT^3	GALS
WELL CASING		2.48
GRAVEL PACK		10.16
DRILLING FLUIDS		

1 vol 12.64

NOTE: QUANTITIES CALCULATED PRIOR TO DEVELOPMENT

DEVELOPMENT CRITERIA

METHOD OF DEVELOPMENT Contractors pump and Teflon bailer
WATER QUALITY MEASUREMENTS: YES ✓ NO ___
WATER VOLUME TO BE REMOVED (GALS) 12.6 MINIMUM 19.0 MAXIMUM 38

NOTE: DEVELOPMENT TO BE PERFORMED IN ACCORDANCE WITH PROJECT SPECIFIC WELL DEVELOPMENT PLAN.

COMMENTS

WELL DEVELOPMENT & PURGING
WATER QUALITY/WATER REMOVAL

SERIAL NO. WD 00011
PAGE ___ OF ___

PROJECT NAME Morrison ph 1 RI
PROJECT NO. 12872832
DATE JUN 28 '87
BORING/WELL NO. G/06D
MAJOR TASK 2294 SUBTASK ___
FORM COMPLETED BY CMZ/DD

WATER QUALITY INSTRUMENTS

DATE	INSTRUMENT	SERIAL NO.	CALIBRATION PERFORMED (✓)	TECHNICIAN
6/28	Orion 210 ph meter	2210	✓	C Maxeiner
6/28	YSI S-C-T meter	12911	✓	C Maxeiner

WATER QUALITY READINGS

DATE	TIME	TOTAL GALLONS REMOVED	TOTAL WELL VOLUMES REMOVED	TEMP. (°C)	DISSOLVED OXYGEN MG/L	pH	REDOX (EH) MV	CONDUCTIVITY UMHOS/CM	APPEARANCE	COMMENTS
6/28	1445	55								
6/28	1530	60		15.1		6.96		73x10	clear	
6/28	1555	65		14.9		6.98		73x10	↓	
6/28	1558	66		14.8		6.97		73x10		

NOTES:

1. COMMENTS SHOULD DELINEATE FINAL SAMPLE AND REPLICATE MEASUREMENTS.
2. ANY INSTRUMENTATION CALIBRATION OR USE ANOMALIES SHOULD BE NOTED.
3. APPEARANCE SHOULD BE NOTED BEFORE, DURING, AND AFTER DEVELOPMENT.

PUMPING TECHNIQUES

DATE	PUMP TYPE	SERIAL NO.	PUMP TECHNICIAN
6/28	CONTRACTORS	-	CM2

WATER REMOVAL DATA

DATE	PUMP ON	PUMP OFF	PUMPING RATE (GPM)	INCREMENTAL GALLONS REMOVED	TOTAL GALLONS REMOVED	INCREMENTAL WELL VOLUMES REMOVED	TOTAL WELL VOLUMES REMOVED	PUMP INTAKE LEVEL	WATER LEVEL BEFORE PUMPING	WATER LEVEL AFTER PUMPING	COMMENTS
6/28	1440	1450	5.5						9'	9'	CM—

WATER SAMPLING DATA

SERIAL NO. WS 000011
PAGE __ OF __

PROJECT NAME Morrison ph 1 R.I. SAMPLE LOCATION NO. OR BORING/WELL NO. G106D
PROJECT NO. 12872832 MAJOR TASK 2294 SUBTASK —
TECHNICAL CREW C Maxeiner / D Davenport
DATE 28 JUN 87 FORM COMPLETED BY CMM/DD

WEATHER Sunny LEVEL OF PROTECTION A B C (D) *
MEASURING POINT Top of Riser METHOD OF MEASUREMENT EWI
MEASURING POINT ELEV. _____ INITIAL WATER LEVEL ELEV. _____

SAMPLING METHOD Teflon Bailer INITIAL WATER LEVEL 9'5"
SPECIAL SAMPLING METHODS _____
TIME ELAPSED/FINAL DEVELOPMENT/PURGING 30 min TECHNICIAN CM2
SAMPLING DEPTH INTERVAL 9' Full PUMPING RATE/SAMPLING —

WATER QUALITY INSTRUMENTS USED	SERIAL NO.	CALIBRATION REFERENCE
1. Orion 210 ph meter	2210	see Orion 210 ph meter Calibration logbook 14
2. YSI S-C-T meter	12911	see YSI S-C-T meter Calibration logbook 13
3. YSI Dissolved Oxygen meter	2992	see YSI D.O. meter Calibration logbook 15
4.		
5.		

FINAL WATER QUALITY INSTRUMENT READINGS

TEMP (°C) 14.1
CONDUCTIVITY (umhos/cm) 72 x 10'
PH 6.97
EH 218
D.O. (mg/l) 8.30
OTHER _____

DUPLICATE WATER SAMPLING DATA INSTRUMENT READINGS

TEMP (°C) 15.0
CONDUCTIVITY (umhos/cm) 75 x 10'
PH 6.97
EH 210
D.O. (mg/l) 8.50

TECHNICIAN CM TIME START 1600 TIME FINISH 1620

SAMPLE COLLECTION PERIOD: START 1600 STOP 1620 TECHNICIAN CM2/DD

*NOTE: FOR LEVELS OF PROTECTION; SEE SITE SPECIFIC SAFETY PLAN FOR DETAILS.

SERIAL NO. WS _____
PAGE __ OF __

TOTAL VOLUME WATER COLLECTED _____ TOTAL NO. OF CONTAINERS 7
FIELD FILTERED: YES ✓ NO __ TIME 1610 TECH. CM FILTER TYPE BAILER
SAMPLES COOLED DURING COLLECTION PERIOD: YES ✓ NO __

SAMPLE CONTAINERS

QUANTITY	CONTAINER MATERIAL	SAMPLE LABEL SERIAL NO.	PRESERVATIVES	COMMENTS
40 ML	GLASS	SL 00034	—	VOA
"	"	SL 00035	—	VOA
½ GAL	"	SL 00036	—	BNA
"	"	SL 00037	—	BNA
1 L.	PLASTIC	SL 00038	HNO_3	TOTAL METALS
1 L.	"	SL 00039	HNO_3	DISS "
1 GAL	"	SL 00040	—	PERFILTRATION

DOCUMENTATION

SAMPLE CONTAINERS SEALED: YES ✓ NO ✓ CM2 TIME _____ TECHNICIAN _____
SAMPLE SHIPPING CONTAINER SEALED & PACKED: YES ✓ NO __ TIME 2200 TECH. CM
LAB ANALYSIS REQUEST FORM: YES ✓ NO __ TIME 2200 SERIAL NO. LAR 2663 TECH. CM
CHAIN OF CUSTODY FORM: YES ✓ NO __ TIME 2200 SERIAL NO. 2663 / 2667 TECH. CM2

COMMENTS: _____

SAMPLE CONTROL SHEET

SERIAL NO. SCS 00004
PAGE ___ OF ___

PROJECT NAME Morrison PH I RI
PROJECT NO. 12872832
SAMPLE LOCATION NO. G106D

DATE JUN 28'87
SAMPLER CM
CUSTODIAN CM

SAMPLE NO.	SAMPLE LABEL NO.	C.O.C. NO.	SHIPPED	LAB ANALYSIS REQUEST NO.
* VOA	SL000 34	2663	JUN 30 87	LAR 2663
VOA	35	↓	↓	↓
BNA	36			
BNA	37			
METAL-TOTAL	38			
METAL-DISS.	39			
PREFILTRATION	40			

WATER SAMPLING DATA

SERIAL NO. WS 00007
PAGE __ OF __

PROJECT NAME Morrison Ph 1 RI
SAMPLE LOCATION NO. OR BORING/WELL NO. TRIP BLANK
PROJECT NO. 1287 2832
MAJOR TASK ~~2293~~ 2294 SUBTASK —
TECHNICAL CREW C Maxeiner / D Davenport
DATE JUN 20, 21 '87
FORM COMPLETED BY CM2/100

WEATHER RAIN
LEVEL OF PROTECTION A B C (D)*
MEASURING POINT —
METHOD OF MEASUREMENT —
MEASURING POINT ELEV. —
INITIAL WATER LEVEL ELEV. —

SAMPLING METHOD —
INITIAL WATER LEVEL —
SPECIAL SAMPLING METHODS —
TIME ELAPSED/FINAL DEVELOPMENT/PURGING —
TECHNICIAN —
SAMPLING DEPTH INTERVAL —
PUMPING RATE/SAMPLING —

WATER QUALITY INSTRUMENTS USED	SERIAL NO.	CALIBRATION REFERENCE
1. —		
2.		
3.		
4.		
5.		

FINAL WATER QUALITY INSTRUMENT READINGS

TEMP (°C)
CONDUCTIVITY (umhos/cm)
PH
EH N/A
D.O. (mg/l)
OTHER
TECHNICIAN
TIME START
TIME FINISH

DUPLICATE WATER SAMPLING DATA INSTRUMENT READINGS

TEMP (°C)
CONDUCTIVITY (umhos/cm)
PH
EH N/A
D.O. (mg/l)

SAMPLE COLLECTION PERIOD: START — STOP — TECHNICIAN —

*NOTE: FOR LEVELS OF PROTECTION; SEE SITE SPECIFIC SAFETY PLAN FOR DETAILS.

SERIAL NO. WS _____
PAGE __ OF __

TOTAL VOLUME WATER COLLECTED — (80 mL) TOTAL NO. OF CONTAINERS 2
FIELD FILTERED: YES __ NO ✓ TIME ____ TECH. ____ FILTER TYPE ____
SAMPLES COOLED DURING COLLECTION PERIOD: YES ✓ NO __

SAMPLE CONTAINERS

QUANTITY	CONTAINER MATERIAL	SAMPLE LABEL SERIAL NO.	PRESERVATIVES	COMMENTS
40ML	GLASS	SL00013	N/A	VOA

DOCUMENTATION

SAMPLE CONTAINERS SEALED: YES __ NO ✓ TIME ____ TECHNICIAN ____
SAMPLE SHIPPING CONTAINER SEALED & PACKED: YES ✓ NO __ TIME 2200 TECH. CM
LAB ANALYSIS REQUEST FORM: YES ✓ NO __ TIME 2200 SERIAL NO. 2995-TB TECH. CM
CHAIN OF CUSTODY FORM: YES ✓ NO __ TIME 2200 SERIAL NO. 2995 / 2996 TECH. CM

COMMENTS: TRIP BLANK DURING "DISCRETE"

WATER SAMPLING DATA

SERIAL NO. WS 00012
PAGE __ OF __

PROJECT NAME Morrison Ph 1 RI
SAMPLE LOCATION NO. OR BORING/WELL NO. TRIP BLANK
PROJECT NO. 12872832
MAJOR TASK 2299 SUBTASK —
TECHNICAL CREW C. Maxeiner / D Davenport
DATE JUN 29 '87
FORM COMPLETED BY CM2/OD

WEATHER Sunny
LEVEL OF PROTECTION A B C (D) *
MEASURING POINT —
METHOD OF MEASUREMENT —
MEASURING POINT ELEV. —
INITIAL WATER LEVEL ELEV. —

SAMPLING METHOD TRIP
INITIAL WATER LEVEL
SPECIAL SAMPLING METHODS a/ ~~GLOSS~~ CM2 City wells
TIME ELAPSED/FINAL DEVELOPMENT/PURGING
TECHNICIAN CM2
SAMPLING DEPTH INTERVAL
PUMPING RATE/SAMPLING

WATER QUALITY INSTRUMENTS USED	SERIAL NO.	CALIBRATION REFERENCE
1. Orion 210 ph meter	2210	see Orion 210 ph Meter Calibration log book
2. YSI S-C-T meter	12911	see YSI S-C-T meter Calibration log book
3. YSI Dissolved Oxygen meter	2992	see YSI D.O. meter Calibration log book
4.		
5.		

FINAL WATER QUALITY INSTRUMENT READINGS

TEMP (°C)
CONDUCTIVITY (umhos/cm)
PH
EH NONE
D.O. (mg/l) TRACE
OTHER

DUPLICATE WATER SAMPLING DATA INSTRUMENT READINGS

TEMP (°C)
CONDUCTIVITY (umhos/cm)
PH
EH
D.O. (mg/l)

TECHNICIAN TIME START TIME FINISH

SAMPLE COLLECTION PERIOD: START 1000 STOP 1800 TECHNICIAN CM2

*NOTE: FOR LEVELS OF PROTECTION; SEE SITE SPECIFIC SAFETY PLAN FOR DETAILS.

SERIAL NO. WS _____
PAGE __ OF __

TOTAL VOLUME WATER COLLECTED 40 mL TOTAL NO. OF CONTAINERS 2
FIELD FILTERED: YES __ NO ✓ TIME _____ TECH. _____ FILTER TYPE _____
SAMPLES COOLED DURING COLLECTION PERIOD: YES ✓ NO __

SAMPLE CONTAINERS

QUANTITY	CONTAINER MATERIAL	SAMPLE LABEL SERIAL NO.	PRESERVATIVES	COMMENTS
40 mL	GLASS	SL-000 41	ICE	TRIP BLANK
40 mL	"	" 42	ICE	TRIP BLANK

DOCUMENTATION

SAMPLE CONTAINERS SEALED: YES __ NO ✓ TIME _____ TECHNICIAN _____
SAMPLE SHIPPING CONTAINER SEALED & PACKED: YES ✓ NO __ TIME 2300 TECH. CAM
LAB ANALYSIS REQUEST FORM: YES ✓ NO __ TIME 2300 SERIAL NO. CAR 2743 TECH. CAM
CHAIN OF CUSTODY FORM: YES ✓ NO __ TIME 2300 SERIAL NO. 2743 / 2744 TECH. CAM

COMMENTS: TRIP BLANK W/ GROSS CITY WELL

WATER SAMPLING DATA

SERIAL NO. WS 00023
PAGE __ OF __

PROJECT NAME Morrison ph1 RI
SAMPLE LOCATION NO. OR BORING/WELL NO. TRIP BLANK
PROJECT NO. 12872832
MAJOR TASK 2295.00 SUBTASK ____
TECHNICAL CREW C Maxeiner / D Davenport
DATE Sun 30 87
FORM COMPLETED BY CM2/DD

WEATHER Sunny
LEVEL OF PROTECTION A B C (D) *
MEASURING POINT —
METHOD OF MEASUREMENT —
MEASURING POINT ELEV. —
INITIAL WATER LEVEL ELEV. —

SAMPLING METHOD TRIP
INITIAL WATER LEVEL —
SPECIAL SAMPLING METHODS ____
TIME ELAPSED/FINAL DEVELOPMENT/PURGING —
TECHNICIAN CM2
SAMPLING DEPTH INTERVAL —
PUMPING RATE/SAMPLING —

WATER QUALITY INSTRUMENTS USED	SERIAL NO.	CALIBRATION REFERENCE
1. N/A		
2.		
3.		
4.		
5.		

FINAL WATER QUALITY INSTRUMENT READINGS

TEMP (°C) N/A
CONDUCTIVITY (umhos/cm)
PH
EH
D.O. (mg/l)
OTHER

DUPLICATE WATER SAMPLING DATA INSTRUMENT READINGS

TEMP (°C)
CONDUCTIVITY (umhos/cm)
PH
EH
D.O. (mg/l)

TECHNICIAN ____ TIME START ____ TIME FINISH ____

SAMPLE COLLECTION PERIOD: START 1600 STOP 1820 TECHNICIAN CM2

*NOTE: FOR LEVELS OF PROTECTION; SEE SITE SPECIFIC SAFETY PLAN FOR DETAILS.

SERIAL NO. WS _____
PAGE __ OF __

TOTAL VOLUME WATER COLLECTED 80 ml TOTAL NO. OF CONTAINERS 2
FIELD FILTERED: YES __ NO ✓ TIME ____ TECH. ____ FILTER TYPE ____
SAMPLES COOLED DURING COLLECTION PERIOD: YES ✓ NO __

SAMPLE CONTAINERS

QUANTITY	CONTAINER MATERIAL	SAMPLE LABEL SERIAL NO.	PRESERVATIVES	COMMENTS
40ml	GLASS	SL000098	—	VOA
40ml	"	" 99	—	VOA

DOCUMENTATION

SAMPLE CONTAINERS SEALED: YES __ NO ✓ TIME ____ TECHNICIAN ____
SAMPLE SHIPPING CONTAINER SEALED & PACKED: YES ✓ NO __ TIME Sulz3 0100 TECH. CM
LAB ANALYSIS REQUEST FORM: YES ✓ NO __ TIME Sulz2 0100 SERIAL NO. 2739 TECH. CM
CHAIN OF CUSTODY FORM: YES ✓ NO __ TIME Sulz3 0100 SERIAL NO. 2739 2740 TECH CM

COMMENTS: w/ 6105D dup

WATER SAMPLING DATA

SERIAL NO. WS 00020
PAGE __ OF __

PROJECT NAME Morrison ph 1 R.I
SAMPLE LOCATION NO. OR BORING/WELL NO. BAILER BLANK
PROJECT NO. 12872832
MAJOR TASK 2294
SUBTASK —
TECHNICAL CREW C Mariner / D Davenport
DATE Jun 30th 87
FORM COMPLETED BY CM/DD

WEATHER DARK
LEVEL OF PROTECTION A B C (D)*
MEASURING POINT N/A
METHOD OF MEASUREMENT N/A
MEASURING POINT ELEV. ____
INITIAL WATER LEVEL ELEV. ____

SAMPLING METHOD Teflon Bailer
INITIAL WATER LEVEL —
SPECIAL SAMPLING METHODS USED DI WATER
TIME ELAPSED/FINAL DEVELOPMENT/PURGING —
TECHNICIAN CM
SAMPLING DEPTH INTERVAL —
PUMPING RATE/SAMPLING —

WATER QUALITY INSTRUMENTS USED	SERIAL NO.	CALIBRATION REFERENCE
1.		
2. N/D		
3.		
4.		
5.		

FINAL WATER QUALITY INSTRUMENT READINGS

TEMP (°C) ____
CONDUCTIVITY (umhos/cm) ____
PH ____
EH ____
D.O. (mg/l) N/D
OTHER ____

DUPLICATE WATER SAMPLING DATA INSTRUMENT READINGS

TEMP (°C) ____
CONDUCTIVITY (umhos/cm) ____
PH ____
EH ____
D.O. (mg/l) ____

TECHNICIAN ____ TIME START ____ TIME FINISH ____

SAMPLE COLLECTION PERIOD: START 2100 1600 CM STOP 2105 TECHNICIAN CM

*NOTE: FOR LEVELS OF PROTECTION; SEE SITE SPECIFIC SAFETY PLAN FOR DETAILS.

SERIAL NO. WS _____
PAGE __ OF __

TOTAL VOLUME WATER COLLECTED 80ML TOTAL NO. OF CONTAINERS 2
FIELD FILTERED: YES __ NO ✓ TIME _____ TECH. _____ FILTER TYPE _____
SAMPLES COOLED DURING COLLECTION PERIOD: YES ✓ NO __

SAMPLE CONTAINERS

QUANTITY	CONTAINER MATERIAL	SAMPLE LABEL SERIAL NO.	PRESERVATIVES	COMMENTS
40ML	GLASS	SL00061	ICE	VOA
40ML	"	↓ 62	ICE	VOA

DOCUMENTATION

SAMPLE CONTAINERS SEALED: YES __ NO ✓ TIME _____ TECHNICIAN _____
SAMPLE SHIPPING CONTAINER SEALED & PACKED: YES ✓ NO __ TIME JUL 2 0100 TECH. CM
LAB ANALYSIS REQUEST FORM: YES ✓ NO __ TIME 0100 SERIAL NO. LAR 2995 TECH. CM
CHAIN OF CUSTODY FORM: YES ✓ NO __ TIME 0100 SERIAL NO. 2995 / 2732 TECH. CM2

COMMENTS: _____

WAPNES

SAMPLE CONTROL SHEET

SERIAL NO. SCS 00010
PAGE ___ OF ___

PROJECT NAME Morrison ph 1 RI
PROJECT NO. 12872832
SAMPLE LOCATION NO. BAILER BLANK

DATE July 1 '87
SAMPLER CAL
CUSTODIAN CAL

SAMPLE NO.	SAMPLE LABEL NO.	C.O.C. NO.	SHIPPED	LAB ANALYSIS REQUEST NO.
VOA	SL00061	2995/2732	JUL 2 '87	LAR 2995
VOA	↓ 62	↓	↓	↓

WELL DEVELOPMENT & PURGING
GENERAL DATA

SERIAL NO. WDG 00013
PAGE OF

NG - NOT GIVEN

PROJECT NAME Morrison ph 1 R.I
PROJECT NO. 12872832
DATE JUN 29 '87 FORM COMPLETED BY CAT / DD

BORING/WELL NO. CITY WELL 1
MAJOR TASK 2294 SUBTASK —

WELL CONSTRUCTION

TOTAL DEPTH (FT) 1595
GRAVEL PACK INTERVAL (FT) NG
WELL PROTECTOR: YES ✓ NO —
FLUID INJECTED DURING DRILLING (QUANTITY) NG

BOREHOLE DIAMETER NG
WELL DIAMETER (ID)(IN) NG
PADLOCK NO. NG

WATER VOLUME DATA

DATE OF MEASUREMENT JUN 29 '87
MEASURING POINT BUBBLE SETTING
WATER LEVEL INSTRUMENT USED
INTIAL WATER LEVEL (FT) ~~NGOT~~ NG
LINEAR FEET OF WATER NG
LINEAR FEET SATURATED GRAVEL PACK NG

WATER VOLUMES		
ITEM	VOLUME	
	FT^3	GALS
WELL CASING		
GRAVEL PACK		
DRILLING FLUIDS		

NOTE: QUANTITIES CALCULATED PRIOR TO DEVELOPMENT

DEVELOPMENT CRITERIA

METHOD OF DEVELOPMENT DISCHARGE TO WASTEWATER TREATMENT PLANT
WATER QUALITY MEASUREMENTS: YES ✓ NO —
WATER VOLUME TO BE REMOVED (GALS) 4 HRS 36000 GALS MINIMUM _____ MAXIMUM _____

NOTE: DEVELOPMENT TO BE PERFORMED IN ACCORDANCE WITH PROJECT SPECIFIC WELL DEVELOPMENT PLAN.

COMMENTS PROD 150 GPM = 36000 GALS

WELL DEVELOPMENT & PURGING
WATER QUALITY/WATER REMOVAL

SERIAL NO. WD 00013
PAGE ___ OF ___

PROJECT NAME Morrison ph 1 RI
PROJECT NO. 12872832
DATE JUN 29 87 FORM COMPLETED BY CH2M/DD

BORING/WELL NO. City Well 1
MAJOR TASK 2294 SUBTASK ___

WATER QUALITY INSTRUMENTS

DATE	INSTRUMENT	SERIAL NO.	CALIBRATION PERFORMED (✓)	TECHNICIAN
6/29	Orion 210 ph meter	2210	✓	C. Maxeiner
6/29	YSI S-C-T meter	12911	✓	C. Maxeiner

WATER QUALITY READINGS

DATE	TIME	TOTAL GALLONS REMOVED	TOTAL WELL VOLUMES REMOVED	TEMP. (°C)	DISSOLVED OXYGEN MG/L	pH	REDOX (EH) MV	CONDUCTIVITY UMHOS/CM	APPEARANCE	COMMENTS
6/29	1055	NG		13.9		7.16		65x10	CLEAR	4 HRS RUNNING
6/29	1057	NG		13.5		7.16		65x10	↓	

NOTES:

1. COMMENTS SHOULD DELINEATE FINAL SAMPLE AND REPLICATE MEASUREMENTS.
2. ANY INSTRUMENTATION CALIBRATION OR USE ANOMALIES SHOULD BE NOTED.
3. APPEARANCE SHOULD BE NOTED BEFORE, DURING, AND AFTER DEVELOPMENT.

PUMPING TECHNIQUES

DATE	PUMP TYPE	SERIAL NO.	PUMP TECHNICIAN
6/29	NG	NG	WALT HEATH

WATER REMOVAL DATA

DATE	PUMP ON	PUMP OFF	PUMPING RATE (GPM)	INCREMENTAL GALLONS REMOVED	TOTAL GALLONS REMOVED	INCREMENTAL WELL VOLUMES REMOVED	TOTAL WELL VOLUMES REMOVED	PUMP INTAKE LEVEL	WATER LEVEL BEFORE PUMPING	WATER LEVEL AFTER PUMPING	COMMENTS
6/29	~~0700~~ 0730	~~1400~~ 1130	150						NS	NG	

WATER SAMPLING DATA

SERIAL NO. WS 00013
PAGE __ OF __

PROJECT NAME Morrison ph 1 R.I
SAMPLE LOCATION NO. OR BORING/WELL NO. City well 1
PROJECT NO. 12872832
MAJOR TASK ~~2295~~ 2294 SUBTASK —
TECHNICAL CREW C Maxeiner / ~~D. Davenport~~ DD
DATE JUN 29 '87
FORM COMPLETED BY CMZ/DD

WEATHER Sunny - PTY Cloudy
LEVEL OF PROTECTION A B C (D)*
MEASURING POINT Bubble
METHOD OF MEASUREMENT Bubble setting
MEASURING POINT ELEV. _____
INITIAL WATER LEVEL ELEV. _____

SAMPLING METHOD TAP
INITIAL WATER LEVEL NG
SPECIAL SAMPLING METHODS TAP
TIME ELAPSED/FINAL DEVELOPMENT/PURGING 5 min
TECHNICIAN CMZ
SAMPLING DEPTH INTERVAL TAP
PUMPING RATE/SAMPLING ~~450~~ cm³/.25 gpm

WATER QUALITY INSTRUMENTS USED	SERIAL NO.	CALIBRATION REFERENCE
1. Orion 210 ph meter	2210	See Orion 210 ph meter Calibration logbook 14
2. YSI S-C-T meter	12911	See ~~Orion~~ DD YSI S-C-T meter Calibration logbook 13
3. YSI Dissolved Oxygen meter	2992	See YSI Dissolved Oxygen Calibration logbook 15
4.		
5.		

FINAL WATER QUALITY INSTRUMENT READINGS

TEMP (°C) 13.8
CONDUCTIVITY (umhos/cm) 65 x10'
PH 7.16
EH 254
D.O. (mg/l) 6.62 / 6.67
OTHER _____

DUPLICATE WATER SAMPLING DATA INSTRUMENT READINGS

TEMP (°C) _____
CONDUCTIVITY (umhos/cm) _____
PH _____
EH _____
D.O. (mg/l) _____

TECHNICIAN CMZ TIME START 1115 TIME FINISH 1120

SAMPLE COLLECTION PERIOD: START 1115 STOP 1120 TECHNICIAN CMZ

*NOTE: FOR LEVELS OF PROTECTION; SEE SITE SPECIFIC SAFETY PLAN FOR DETAILS.

SERIAL NO. WS _____
PAGE __ OF __

TOTAL VOLUME WATER COLLECTED 80 mL TOTAL NO. OF CONTAINERS 2
FIELD FILTERED: YES __ NO ✓ TIME _____ TECH. _____ FILTER TYPE _____
SAMPLES COOLED DURING COLLECTION PERIOD: YES ✓ NO __

SAMPLE CONTAINERS

QUANTITY	CONTAINER MATERIAL	SAMPLE LABEL SERIAL NO.	PRESERVATIVES	COMMENTS
40 mL	GLASS	SL 00043	ICE	VOA
40 mL	"	↓ 44	ICE	VOA

DOCUMENTATION

SAMPLE CONTAINERS SEALED: YES __ NO ✓ TIME _____ TECHNICIAN _____
SAMPLE SHIPPING CONTAINER SEALED & PACKED: YES ✓ NO __ TIME 2300 TECH. CM
LAB ANALYSIS REQUEST FORM: YES ✓ NO __ TIME 2300 SERIAL NO. LAR 2743 TECH. CM
CHAIN OF CUSTODY FORM: YES ✓ NO __ TIME 2300 SERIAL NO. 2743 / 2744 TECH. CM

COMMENTS: _____

SAMPLE CONTROL SHEET

SERIAL NO. SCS 00005
PAGE ___ OF ___

PROJECT NAME Morrison RH I RI
PROJECT NO. 12872832
SAMPLE LOCATION NO. City Well 1
DATE 6/29/87
SAMPLER CAR
CUSTODIAN CAR

SAMPLE NO.	SAMPLE LABEL NO.	C.O.C. NO.	SHIPPED	LAB ANALYSIS REQUEST NO.
City Well 1	SL 000 43	EA 2743	Jun 30 '87	CAR 2743
"	" 44	✓	✓	✓

WELL DEVELOPMENT & PURGING
GENERAL DATA

SERIAL NO. WDG
PAGE OF 00015

PROJECT NAME Morrison Ph 1 RI
PROJECT NO. 12872832
DATE JUN 29 '87 FORM COMPLETED BY CM²/DD

BORING/WELL NO. City Well #3 & Dup
MAJOR TASK 2294 SUBTASK —

WELL CONSTRUCTION

TOTAL DEPTH (FT) 1600'
GRAVEL PACK INTERVAL (FT) NG
WELL PROTECTOR: YES ✓ NO —
FLUID INJECTED DURING DRILLING (QUANTITY) NG

BOREHOLE DIAMETER NG
WELL DIAMETER (ID)(IN) NG
PADLOCK NO. NG

WATER VOLUME DATA

DATE OF MEASUREMENT JUN 29 '87
MEASURING POINT BUBBLE SETTING
WATER LEVEL INSTRUMENT USED ~~E-W~~ or BUBBLE
INTIAL WATER LEVEL (FT) 170'
LINEAR FEET OF WATER NG
LINEAR FEET SATURATED GRAVEL PACK NG

WATER VOLUMES		
ITEM	VOLUME	
	FT^3	GALS
WELL CASING		
GRAVEL PACK		
DRILLING FLUIDS		

NOTE: QUANTITIES CALCULATED PRIOR TO DEVELOPMENT

DEVELOPMENT CRITERIA

METHOD OF DEVELOPMENT DISCHARGE
WATER QUALITY MEASUREMENTS: YES ✓ NO —
WATER VOLUME TO BE REMOVED (GALS) 156000 MINIMUM _____ MAXIMUM _____

NOTE: DEVELOPMENT TO BE PERFORMED IN ACCORDANCE WITH PROJECT SPECIFIC WELL DEVELOPMENT PLAN.

COMMENTS PUMP RATE 650 gpm = 156000 gals.

WELL DEVELOPMENT & PURGING
WATER QUALITY/WATER REMOVAL

SERIAL NO. WD 00015
PAGE ___ OF ___

PROJECT NAME Morrison Ph 1 R.I
PROJECT NO. 12872832
DATE JUN 29 '87 FORM COMPLETED BY CM2/DD

BORING/WELL NO. City Well #3
MAJOR TASK 2294 SUBTASK —

WATER QUALITY INSTRUMENTS

DATE	INSTRUMENT	SERIAL NO.	CALIBRATION PERFORMED (✓)	TECHNICIAN
6/29	Orion 210 ph meter	2210	✓	C. Maxeiner
6/29	YSI S-C-T meter	12911	✓	C. Maxeiner

WATER QUALITY READINGS

DATE	TIME	TOTAL GALLONS REMOVED	TOTAL WELL VOLUMES REMOVED	TEMP. (°C)	DISSOLVED OXYGEN MG/L	PH	REDOX (EH) MV	CONDUCTIVITY UMHOS/CM	APPEARANCE	COMMENTS
6/29	1140	26		15.1		7.30		51x10²	CLEAR	4 Hrs. 40 MIN
6/29	1146	26		15.0		7.32		51x10²	↓	

NOTES:

1. COMMENTS SHOULD DELINEATE FINAL SAMPLE AND REPLICATE MEASUREMENTS.
2. ANY INSTRUMENTATION CALIBRATION OR USE ANOMALIES SHOULD BE NOTED.
3. APPEARANCE SHOULD BE NOTED BEFORE, DURING, AND AFTER DEVELOPMENT.

WATER SAMPLING DATA

SERIAL NO. WS 00015
PAGE __ OF __

PROJECT NAME Morrison ph 1 RI
SAMPLE LOCATION NO. OR BORING/WELL NO. City Well #3
PROJECT NO. 12872832
MAJOR TASK 2293 2294 SUBTASK —
TECHNICAL CREW C. Maxeiner
DATE JUN 29 '87
FORM COMPLETED BY CM²/DD

WEATHER Sunny - PTL cloy
LEVEL OF PROTECTION A B C (D) *
MEASURING POINT BUBBLE SETTING
METHOD OF MEASUREMENT Bubble
MEASURING POINT ELEV. NG
INITIAL WATER LEVEL ELEV. NC

SAMPLING METHOD TAP
INITIAL WATER LEVEL STATIC - 170' pumping - 210'
SPECIAL SAMPLING METHODS TAP
TIME ELAPSED/FINAL DEVELOPMENT/PURGING 5 Min
TECHNICIAN CM²
SAMPLING DEPTH INTERVAL TAP
PUMPING RATE/SAMPLING <25 gpm

WATER QUALITY INSTRUMENTS USED	SERIAL NO.	CALIBRATION REFERENCE
1. Orion 210 ph meter	2210	see - Orion 210 ph meter Calibration logbook 14
2. YSI S-C-T meter	12911	see YSI S-C-T meter Calibration logbook 13
3. YSI Dissolved Oxygen meter	2992	see YSI D.O. meter Calibration logbook 15
4.		
5.		

FINAL WATER QUALITY INSTRUMENT READINGS

TEMP (°C) 15.0
CONDUCTIVITY (umhos/cm) 51 X 10'
PH 7.28
EH 222
D.O. (mg/l) 5.36
OTHER —

DUPLICATE WATER SAMPLING DATA INSTRUMENT READINGS

TEMP (°C) —
CONDUCTIVITY (umhos/cm) —
PH —
EH —
D.O. (mg/l) —

TECHNICIAN CM² TIME START 1200 TIME FINISH 1205

SAMPLE COLLECTION PERIOD: START 1200 STOP 1205 TECHNICIAN CM²

*NOTE: FOR LEVELS OF PROTECTION; SEE SITE SPECIFIC SAFETY PLAN FOR DETAILS.

SERIAL NO. WS _____
PAGE __ OF __

TOTAL VOLUME WATER COLLECTED 80ML TOTAL NO. OF CONTAINERS 2
FIELD FILTERED: YES __ NO ✓ TIME ____ TECH. ____ FILTER TYPE ____
SAMPLES COOLED DURING COLLECTION PERIOD: YES ✓ NO __

SAMPLE CONTAINERS

QUANTITY	CONTAINER MATERIAL	SAMPLE LABEL SERIAL NO.	PRESERVATIVES	COMMENTS
40ML	GLASS	31000 45	ICE	VOA
40ML	"	" 46	↓	VOA

DOCUMENTATION

SAMPLE CONTAINERS SEALED: YES __ NO ✓ TIME ____ TECHNICIAN ____
SAMPLE SHIPPING CONTAINER SEALED & PACKED: YES ✓ NO __ TIME 2300 TECH. CM
LAB ANALYSIS REQUEST FORM: YES ✓ NO __ TIME 2300 SERIAL NO. LAR 2744 TECH. CM2
CHAIN OF CUSTODY FORM: YES ✓ NO __ TIME 2300 SERIAL NO. 2743 / 2744 TECH. CM2

COMMENTS: ____

WATER SAMPLING DATA

SERIAL NO. WS 00014
PAGE __ OF __

PROJECT NAME Morrison ph 1 R.I.
SAMPLE LOCATION NO. OR BORING/WELL NO. City Well #3 Dup
PROJECT NO. 12872832
MAJOR TASK 2294 SUBTASK ——
TECHNICAL CREW C. Maxeiner
DATE JUN 29 '87
FORM COMPLETED BY CMC/DD

WEATHER Sunny - PTL Cloudy
LEVEL OF PROTECTION A B C D*
MEASURING POINT Bubble Setting
METHOD OF MEASUREMENT Bubble
MEASURING POINT ELEV. ——
INITIAL WATER LEVEL ELEV. ——

STATIC -170'

SAMPLING METHOD TAP
INITIAL WATER LEVEL Pumping - 210'
SPECIAL SAMPLING METHODS TAP
TIME ELAPSED/FINAL DEVELOPMENT/PURGING 5 1/4 in
TECHNICIAN CMC
SAMPLING DEPTH INTERVAL TAP
PUMPING RATE/SAMPLING .25 gpm

WATER QUALITY INSTRUMENTS USED	SERIAL NO.	CALIBRATION REFERENCE
1. Orion 210 ph meter	2210	See Orion 210 ph meter Calibration logbook 14
2. YSI S-C-T meter	12911	See YSI S-C-T meter Calibration logbook 13
3. YSI Dissolved Oxygen meter	2992	See YSI D.O. meter Calibration logbook 15
4.		
5.		

FINAL WATER QUALITY INSTRUMENT READINGS

TEMP (°C) 15.0
CONDUCTIVITY (umhos/cm) 51x10'
PH 7.28
EH 222
D.O. (mg/l) 5.36
OTHER ——
TECHNICIAN CMC TIME START 1205 PD TIME FINISH 1210

DUPLICATE WATER SAMPLING DATA INSTRUMENT READINGS

TEMP (°C) ——
CONDUCTIVITY (umhos/cm) ——
PH ——
EH ——
D.O. (mg/l) ——

SAMPLE COLLECTION PERIOD: START 1205 STOP 1210 TECHNICIAN CMC

*NOTE: FOR LEVELS OF PROTECTION; SEE SITE SPECIFIC SAFETY PLAN FOR DETAILS.

SAMPLE CONTROL SHEET

SERIAL NO. SCS 00006
PAGE __ OF __

PROJECT NAME Monticello PH I RI/FS
PROJECT NO. CB72832
SAMPLE LOCATION NO. City Well #3

DATE 6/29/87
SAMPLER CMR
CUSTODIAN CMR

SAMPLE NO.	SAMPLE LABEL NO.	C.O.C. NO.	SHIPPED	LAB ANALYSIS REQUEST NO.
City Well #3	SL000 45	2743	Jun 30 '87	CAR 2743
4	46	↓	↓	↓
City Well #3 Dup	47			
"	48			

WELL DEVELOPMENT & PURGING
GENERAL DATA

SERIAL NO. WDG 00016
PAGE OF

PROJECT NAME Morrison ph 1 RI
PROJECT NO. 12872832
DATE JUN 29 '87 FORM COMPLETED BY CH2/DD

BORING/WELL NO. CITY WELL #4
MAJOR TASK 2294 SUBTASK —

WELL CONSTRUCTION

TOTAL DEPTH (FT) 1737
GRAVEL PACK INTERVAL (FT) NG
WELL PROTECTOR: YES ✓ NO ___
FLUID INJECTED DURING DRILLING (QUANTITY) NG

BOREHOLE DIAMETER 10
WELL DIAMETER (ID)(IN) NG
PADLOCK NO. NG

WATER VOLUME DATA

DATE OF MEASUREMENT 6/29/87
MEASURING POINT BUBBLE SETTING
WATER LEVEL INSTRUMENT USED BUBBLE
INTIAL WATER LEVEL (FT) 220'
LINEAR FEET OF WATER NG
LINEAR FEET SATURATED GRAVEL PACK NG

WATER VOLUMES		
ITEM	VOLUME FT^3	VOLUME GALS
WELL CASING		
GRAVEL PACK		
DRILLING FLUIDS		

NOTE: QUANTITIES CALCULATED PRIOR TO DEVELOPMENT

DEVELOPMENT CRITERIA

METHOD OF DEVELOPMENT DISCHARGE
WATER QUALITY MEASUREMENTS: YES ✓ NO ___
WATER VOLUME TO BE REMOVED (GALS) 474600 MINIMUM _____ MAXIMUM _____

NOTE: DEVELOPMENT TO BE PERFORMED IN ACCORDANCE WITH PROJECT SPECIFIC WELL DEVELOPMENT PLAN.

COMMENTS RATE 1130 GPM (7 hrs.) = 474600

WELL DEVELOPMENT & PURGING WATER QUALITY/WATER REMOVAL

SERIAL NO. WD - 00016
PAGE ___ OF ___

PROJECT NAME Morrison ph 1 RI
PROJECT NO. 12872832
DATE JUN 29 '87 FORM COMPLETED BY CM²/DD
BORING/WELL NO. City Well #4
MAJOR TASK 2294 SUBTASK ___

WATER QUALITY INSTRUMENTS

DATE	INSTRUMENT	SERIAL NO.	CALIBRATION PERFORMED (✓)	TECHNICIAN
6/29	Orion 210 ph meter	2210	✓	C Maxeiner
6/29	YSI S-C-T meter	12911	✓	C. Maxeiner

WATER QUALITY READINGS

DATE	TIME	TOTAL GALLONS REMOVED	TOTAL WELL VOLUMES REMOVED	TEMP. (°C)	DISSOLVED OXYGEN MG/L	pH	REDOX (EH) MV	CONDUCTIVITY UMHOS/CM	APPEARANCE	COMMENTS
6/29	1335	NC		15.0		7.27		420 uS	CLEAR	7 Hrs Run
6/29	1340	NC		15.0		7.31		422 uS	↓	High Sulpher Smell

NOTES:

1. COMMENTS SHOULD DELINEATE FINAL SAMPLE AND REPLICATE MEASUREMENTS.
2. ANY INSTRUMENTATION CALIBRATION OR USE ANOMALIES SHOULD BE NOTED.
3. APPEARANCE SHOULD BE NOTED BEFORE, DURING, AND AFTER DEVELOPMENT.

PUMPING TECHNIQUES

DATE	PUMP TYPE	SERIAL NO.	PUMP TECHNICIAN
6/20	NC	—	WALT HEATH

WATER REMOVAL DATA

DATE	PUMP ON	PUMP OFF	PUMPING RATE (GPM)	INCREMENTAL GALLONS REMOVED	TOTAL GALLONS REMOVED	INCREMENTAL WELL VOLUMES REMOVED	TOTAL WELL VOLUMES REMOVED	PUMP INTAKE LEVEL	WATER LEVEL BEFORE PUMPING	WATER LEVEL AFTER PUMPING	COMMENTS
6/29	630	1330	1130						270	355	7 HRS. RUNNING

WATER SAMPLING DATA

SERIAL NO. WS 00016
PAGE __ OF __

PROJECT NAME Morrison ph 1 RI
SAMPLE LOCATION NO. OR BORING/WELL NO. City well #4
PROJECT NO. 12872832
MAJOR TASK 2294
SUBTASK ——
TECHNICAL CREW C. Maxeiner
DATE JUN 29 '87
FORM COMPLETED BY CMR/DD

WEATHER Sunny - Ptly Cloudy
LEVEL OF PROTECTION A B C (D)*
MEASURING POINT Bubble setting
METHOD OF MEASUREMENT Bubble
MEASURING POINT ELEV. NG
INITIAL WATER LEVEL ELEV. NG

STATIC - 270'

SAMPLING METHOD Tap
INITIAL WATER LEVEL pumping - 355'
SPECIAL SAMPLING METHODS Tap
TIME ELAPSED/FINAL DEVELOPMENT/PURGING 5 min
TECHNICIAN CMR
SAMPLING DEPTH INTERVAL Tap
PUMPING RATE/SAMPLING .25 GPM

WATER QUALITY INSTRUMENTS USED	SERIAL NO.	CALIBRATION REFERENCE
1. Orion 210 ph meter	2210	See Orion 210 ph meter Calibration logbook 14
2. YSI S-C-T meter	12911	see YSI S-CT-meter Calibration logbook, 3
3. YSI Dissolved Oxygen	2992	See YSI DO meter Calibration logbook 15
4.		
5.		

FINAL WATER QUALITY INSTRUMENT READINGS

TEMP (°C) 15.0
CONDUCTIVITY (umhos/cm) 425 x 10°
PH 7.32
EH 152
D.O. (mg/l) 5.64
OTHER

DUPLICATE WATER SAMPLING DATA INSTRUMENT READINGS

TEMP (°C)
CONDUCTIVITY (umhos/cm)
PH
EH
D.O. (mg/l)

TECHNICIAN CMR TIME START 1345 TIME FINISH 1350

SAMPLE COLLECTION PERIOD: START 1345 STOP 1350 TECHNICIAN CMR

*NOTE: FOR LEVELS OF PROTECTION; SEE SITE SPECIFIC SAFETY PLAN FOR DETAILS.

SERIAL NO. WS _____
PAGE __ OF __

TOTAL VOLUME WATER COLLECTED 80 mL TOTAL NO. OF CONTAINERS 2
FIELD FILTERED: YES __ NO ✓ TIME ____ TECH. ____ FILTER TYPE ____
SAMPLES COOLED DURING COLLECTION PERIOD: YES ✓ NO __

SAMPLE CONTAINERS

QUANTITY	CONTAINER MATERIAL	SAMPLE LABEL SERIAL NO.	PRESERVATIVES	COMMENTS
40 mL	GLASS	SC000 49	ICE	VOA
40 mL	"	↓ 50	ICE	VOA

DOCUMENTATION

SAMPLE CONTAINERS SEALED: YES __ NO ✓ TIME ____ TECHNICIAN ____
SAMPLE SHIPPING CONTAINER SEALED & PACKED: YES ✓ NO __ TIME 2300 TECH. CMC
LAB ANALYSIS REQUEST FORM: YES ✓ NO __ TIME 2300 SERIAL NO LAR 2743 TECH. CMC
CHAIN OF CUSTODY FORM: YES ✓ NO __ TIME 2300 SERIAL NO. 2743 2744 TECH. CMC

COMMENTS: ____

SAMPLE CONTROL SHEET

SERIAL NO. SCS 00007
PAGE ___ OF ___

PROJECT NAME Morrison PH I RI
PROJECT NO. 12872E37
SAMPLE LOCATION NO. City Well #4
DATE 6/29/87
SAMPLER Cur
CUSTODIAN Cur

SAMPLE NO.	SAMPLE LABEL NO.	C.O.C. NO.	SHIPPED	LAB ANALYSIS REQUEST NO.
City Well #4	SL00049	2743	JUN 30 '87	LAR 2743
↓	↓ 50	↓	↓	↓

WELL DEVELOPMENT & PURGING
GENERAL DATA

SERIAL NO. WDG
PAGE OF 00030

PROJECT NAME Monson ph 1 RI
PROJECT NO. 12872832
DATE SUN 30 '27 FORM COMPLETED BY CRC/DD
BORING/WELL NO. EE well
MAJOR TASK 2294 SUBTASK —

WELL CONSTRUCTION

TOTAL DEPTH (FT) Not Given!
GRAVEL PACK INTERVAL (FT) NG
WELL PROTECTOR: YES ✓ NO —
FLUID INJECTED DURING DRILLING (QUANTITY) NG
BOREHOLE DIAMETER NG
WELL DIAMETER (ID)(IN) NG
PADLOCK NO. N/A

WATER VOLUME DATA

DATE OF MEASUREMENT —
MEASURING POINT —
WATER LEVEL INSTRUMENT USED —
INTIAL WATER LEVEL (FT) —
LINEAR FEET OF WATER —
LINEAR FEET SATURATED GRAVEL PACK —

WATER VOLUMES		
ITEM	VOLUME	
	FT^3	GALS
WELL CASING		
GRAVEL PACK		
DRILLING FLUIDS		

NOTE: QUANTITIES CALCULATED PRIOR TO DEVELOPMENT

DEVELOPMENT CRITERIA

METHOD OF DEVELOPMENT Running Flush
WATER QUALITY MEASUREMENTS: YES ✓ NO —
WATER VOLUME TO BE REMOVED (GALS) — MINIMUM — MAXIMUM —
→ 1045 - 1520

NOTE: DEVELOPMENT TO BE PERFORMED IN ACCORDANCE WITH PROJECT SPECIFIC WELL DEVELOPMENT PLAN.

COMMENTS

WELL DEVELOPMENT & PURGING
WATER QUALITY/WATER REMOVAL

SERIAL NO. WD 00030
PAGE ___ OF ___

PROJECT NAME Morrison ph 1 RI
PROJECT NO. 12872832
DATE JUN 30 '87
BORING/WELL NO. GE WELL
MAJOR TASK 2294 SUBTASK ___
FORM COMPLETED BY CM2/DD

WATER QUALITY INSTRUMENTS

DATE	INSTRUMENT	SERIAL NO.	CALIBRATION PERFORMED (✓)	TECHNICIAN
6/30	Orion 210 ph meter	2210	✓	D Davenport
6/30	YSI - S-C-T meter	12911	✓	D Davenport

WATER QUALITY READINGS

DATE	TIME	TOTAL GALLONS REMOVED	TOTAL WELL VOLUMES REMOVED	TEMP. (°C)	DISSOLVED OXYGEN MG/L	PH	REDOX (EH) MV	CONDUCTIVITY UMHOS/CM	APPEARANCE	COMMENTS
6/30	1511			14.5	8.03	7.13	224	86x10¹	CLEAR	
6/30	1514			14.9	7.11	7.08	195	86x10¹	↓	

NOTES:

1. COMMENTS SHOULD DELINEATE FINAL SAMPLE AND REPLICATE MEASUREMENTS.
2. ANY INSTRUMENTATION CALIBRATION OR USE ANOMALIES SHOULD BE NOTED.
3. APPEARANCE SHOULD BE NOTED BEFORE, DURING, AND AFTER DEVELOPMENT.

PUMPING TECHNIQUES

DATE	PUMP TYPE	SERIAL NO.	PUMP TECHNICIAN
NG →		→	

WATER REMOVAL DATA

DATE	PUMP ON	PUMP OFF	PUMPING RATE (GPM)	INCREMENTAL GALLONS REMOVED	TOTAL GALLONS REMOVED	INCREMENTAL WELL VOLUMES REMOVED	TOTAL WELL VOLUMES REMOVED	PUMP INTAKE LEVEL	WATER LEVEL BEFORE PUMPING	WATER LEVEL AFTER PUMPING	COMMENTS
NG →										→	

WATER SAMPLING DATA

SERIAL NO. WS 00030
PAGE __ OF __

PROJECT NAME Morrison ph 1 RI
SAMPLE LOCATION NO. OR BORING/WELL NO. GEWELL
PROJECT NO. 12872832
MAJOR TASK 2294
SUBTASK —
TECHNICAL CREW C Maxeiner / D. Davenport
DATE JUN 30 '87
FORM COMPLETED BY CM2/DD

WEATHER Ply cldy
LEVEL OF PROTECTION A B C (D) *
MEASURING POINT —
METHOD OF MEASUREMENT —
MEASURING POINT ELEV. ____
INITIAL WATER LEVEL ELEV. ____

SAMPLING METHOD TAP
INITIAL WATER LEVEL —
SPECIAL SAMPLING METHODS ____
TIME ELAPSED/FINAL DEVELOPMENT/PURGING ____
TECHNICIAN CM2
SAMPLING DEPTH INTERVAL TAP
PUMPING RATE/SAMPLING ____

WATER QUALITY INSTRUMENTS USED	SERIAL NO.	CALIBRATION REFERENCE	
1. Orion 210 pH meter	2210	see Orion 210 pH meter Calibration logbook	14
2. YSI S-C-T meter	12911	see YSI S-C-T meter Calibration logbook	13
3. YSI Dissolved Oxygen meter	2992	see YSI D.O. meter Calibration logbook	15
4.			
5.			

FINAL WATER QUALITY INSTRUMENT READINGS

TEMP (°C) 14.0
CONDUCTIVITY (umhos/cm) 85x10'
PH 7.13
EH 205
D.O. (mg/l) 8.14
OTHER ____

DUPLICATE WATER SAMPLING DATA INSTRUMENT READINGS

TEMP (°C) ____
CONDUCTIVITY (umhos/cm) ____
PH ____
EH ____
D.O. (mg/l) ____

TECHNICIAN CM2 TIME START 1520 TIME FINISH 1525

SAMPLE COLLECTION PERIOD: START 1520 STOP 1525 TECHNICIAN CM2

*NOTE: FOR LEVELS OF PROTECTION; SEE SITE SPECIFIC SAFETY PLAN FOR DETAILS.

SERIAL NO. WS _____
PAGE __ OF __

TOTAL VOLUME WATER COLLECTED 80 mL TOTAL NO. OF CONTAINERS 2
FIELD FILTERED: YES __ NO ✓ TIME _____ TECH. _____ FILTER TYPE _____
SAMPLES COOLED DURING COLLECTION PERIOD: YES ✓ NO __

SAMPLE CONTAINERS

QUANTITY	CONTAINER MATERIAL	SAMPLE LABEL SERIAL NO.	PRESERVATIVES	COMMENTS
2x 40mL	GLASS	SL00082 i 83	-	VOA's

DOCUMENTATION

SAMPLE CONTAINERS SEALED: YES __ NO ✓ TIME _____ TECHNICIAN _____
SAMPLE SHIPPING CONTAINER SEALED & PACKED: YES ✓ NO __ TIME Jul 2 0100 TECH. COM
LAB ANALYSIS REQUEST FORM: YES ✓ NO __ TIME Jul 2 0100 SERIAL NO. 2231 TECH. CMC
CHAIN OF CUSTODY FORM: YES ✓ NO __ TIME Jul 2 0100 SERIAL NO. 2231 2234 TECH. COM

COMMENTS: _____

SAMPLE CONTROL SHEET

SERIAL NO. SCS 00916
PAGE ___ OF ___

PROJECT NAME Morrison PH1 RF
PROJECT NO. 12872832
SAMPLE LOCATION NO. GE Well

DATE JUN 30 '87
SAMPLER GMT
CUSTODIAN GW

SAMPLE NO.	SAMPLE LABEL NO.	C.O.C. NO.	SHIPPED	LAB ANALYSIS REQUEST NO.
VOA's	SL00082 & 83	2231/2734	July 2 '87	2231

APPENDIX E

SURFACE WATER AND SEDIMENT SAMPLING FORMS

WATER SAMPLING DATA

SERIAL NO. WS 00022
PAGE __ OF __

PROJECT NAME Marrison pit 1 RI
SAMPLE LOCATION NO. OR BORING/WELL NO. S101
PROJECT NO. 12872832
MAJOR TASK 2293
SUBTASK —
TECHNICAL CREW C Maxeiner / D Davenport
DATE JUN 30 '87
FORM COMPLETED BY CM2/DD

WEATHER Sunny
LEVEL OF PROTECTION A B C (D)*
MEASURING POINT WATER SURFACE
METHOD OF MEASUREMENT TAPE
MEASURING POINT ELEV. _____
INITIAL WATER LEVEL ELEV. _____

SAMPLING METHOD POINT Source Bailer
INITIAL WATER DEPTH LEVEL 2'
SPECIAL SAMPLING METHODS _____
TIME ELAPSED/FINAL DEVELOPMENT/PURGING _____
TECHNICIAN CM
SAMPLING DEPTH INTERVAL 4.0-7.0'
PUMPING RATE/SAMPLING _____

WATER QUALITY INSTRUMENTS USED	SERIAL NO.	CALIBRATION REFERENCE
1. ORION 210 pH METER	2210	CAL BOOK 14
2. YSI SCT METER	12911	" " 13
3. YSI DO METER	2992	" " 15
4.		
5.		

FINAL WATER QUALITY INSTRUMENT READINGS

TEMP (°C) 20.8
CONDUCTIVITY (umhos/cm) 63 x 10'
PH 8.01
EH 270
D.O. (mg/l) 7.50
OTHER _____

DUPLICATE WATER SAMPLING DATA INSTRUMENT READINGS

TEMP (°C) _____
CONDUCTIVITY (umhos/cm) _____
PH _____
EH _____
D.O. (mg/l) _____

TECHNICIAN CM2 TIME START 0850 TIME FINISH 0855

SAMPLE COLLECTION PERIOD: START 0850 STOP 0855 TECHNICIAN CM

*NOTE: FOR LEVELS OF PROTECTION; SEE SITE SPECIFIC SAFETY PLAN FOR DETAILS.

SERIAL NO. WS _____
PAGE __ OF __

TOTAL VOLUME WATER COLLECTED 60ML TOTAL NO. OF CONTAINERS 2
FIELD FILTERED: YES __ NO ✓ TIME _____ TECH. _____ FILTER TYPE _____
SAMPLES COOLED DURING COLLECTION PERIOD: YES ~~NO~~ __

SAMPLE CONTAINERS

QUANTITY	CONTAINER MATERIAL	SAMPLE LABEL SERIAL NO.	PRESERVATIVES	COMMENTS
2-40ML	GLASS	SL000 70 & 71	ICE	VOA

DOCUMENTATION

SAMPLE CONTAINERS SEALED: YES __ NO ✓ TIME _____ TECHNICIAN _____
SAMPLE SHIPPING CONTAINER SEALED & PACKED: YES ✓ NO __ TIME Jul 2 0900 TECH. CM
LAB ANALYSIS REQUEST FORM: YES ✓ NO __ TIME Jul 2 0900 SERIAL NO. 2231 TECH. CM
CHAIN OF CUSTODY FORM: YES ✓ NO __ TIME Jul 2 0900 SERIAL NO. 2231 2734 TECH. CM

COMMENTS: _____

Soil
~~WATER~~ SAMPLING DATA

SERIAL NO. WS 00023
PAGE __ OF __

PROJECT NAME Morrison PH1 RI
SAMPLE LOCATION NO. OR BORING/WELL NO. S101
PROJECT NO. 12872832 MAJOR TASK 2294 SUBTASK —
TECHNICAL CREW G.MAKEINEN
DATE JUN 30 '87 FORM COMPLETED BY CMZ/DD

WEATHER Sunny LEVEL OF PROTECTION A B C (D)*
MEASURING POINT W.SURFACE METHOD OF MEASUREMENT TAPE
MEASURING POINT ELEV. _____ INITIAL WATER LEVEL ELEV. _____

SAMPLING METHOD Bottom ~~Seed Screen~~ Sampler INITIAL WATER ~~LEVEL~~ Depth 7.0'
SPECIAL SAMPLING METHODS _____
TIME ELAPSED/FINAL DEVELOPMENT/PURGING _____ TECHNICIAN CMZ
SAMPLING DEPTH INTERVAL 7-8' PUMPING RATE/SAMPLING _____

WATER QUALITY INSTRUMENTS USED	SERIAL NO.	CALIBRATION REFERENCE
1.		
2. N/A		
3.		
4.		
5.		

FINAL WATER QUALITY INSTRUMENT READINGS

TEMP (°C) _____
CONDUCTIVITY (umhos/cm) N/A
PH _____
EH _____
D.O. (mg/l) _____
OTHER _____

DUPLICATE WATER SAMPLING DATA INSTRUMENT READINGS

TEMP (°C) _____
CONDUCTIVITY (umhos/cm) _____
PH _____
EH _____
D.O. (mg/l) _____

TECHNICIAN CMZ TIME START _____ TIME FINISH _____

SAMPLE COLLECTION PERIOD: START 0830 STOP 0850 TECHNICIAN CMZ

*NOTE: FOR LEVELS OF PROTECTION; SEE SITE SPECIFIC SAFETY PLAN FOR DETAILS.

SERIAL NO. WS _____
PAGE __ OF __

TOTAL VOLUME WATER COLLECTED 207 TOTAL NO. OF CONTAINERS 1
FIELD FILTERED: YES __ NO ✓ TIME _____ TECH. _____ FILTER TYPE _____
SAMPLES COOLED DURING COLLECTION PERIOD: YES ✓ NO __

SAMPLE CONTAINERS

QUANTITY	CONTAINER MATERIAL	SAMPLE LABEL SERIAL NO.	PRESERVATIVES	COMMENTS
202	GLASS	SL00072	ICE	VOA — 1011

DOCUMENTATION

SAMPLE CONTAINERS SEALED: YES __ NO ✓ TIME _____ TECHNICIAN _____
SAMPLE SHIPPING CONTAINER SEALED & PACKED: YES ✓ NO __ TIME July 2 0160 TECH. CAZ
LAB ANALYSIS REQUEST FORM: YES ✓ NO __ TIME July 2 0900 SERIAL NO. 2231 TECH. CAZ
CHAIN OF CUSTODY FORM: YES ✓ NO __ TIME July 2 0900 SERIAL NO. 2231 / 2234 TECH. CAZ

COMMENTS: DICER Sandy Silt w/ORG. GRAV

SAMPLE CONTROL SHEET

SERIAL NO. SCS 00012
PAGE ___ OF ___

PROJECT NAME Morrison PH I RI
PROJECT NO. 12872032
SAMPLE LOCATION NO. S101

DATE Jun 30 '87
SAMPLER CAS
CUSTODIAN CAS

SAMPLE NO.	SAMPLE LABEL NO.	C.O.C. NO.	SHIPPED	LAB ANALYSIS REQUEST NO.
2-40ml	SL00070271	2231/2734	Jul 2 '87	LAR2231
2oz.	↓ 72	2231/2734	↓	↓

Surface WATER SAMPLING DATA

SERIAL NO. WS - 00017
PAGE __ OF __

PROJECT NAME Morrison Ph 1 R.I. SAMPLE LOCATION NO. OR BORING/WELL NO. ETHAN ALLEN POND SB2
PROJECT NO. 12872832 MAJOR TASK 2294 SUBTASK —
TECHNICAL CREW C Maxeiner
DATE JUN 29 '87 FORM COMPLETED BY CM²/DD

WEATHER Sunny LEVEL OF PROTECTION A B C (D) *
MEASURING POINT GS METHOD OF MEASUREMENT STEEL TAPE
MEASURING POINT ELEV. NG INITIAL WATER LEVEL ELEV. NG

SAMPLING METHOD Teflon Bailer INITIAL WATER LEVEL 0'
SPECIAL SAMPLING METHODS Point Source
TIME ELAPSED/FINAL DEVELOPMENT/PURGING — TECHNICIAN —
SAMPLING DEPTH INTERVAL At Surface PUMPING RATE/SAMPLING —

WATER QUALITY INSTRUMENTS USED	SERIAL NO.	CALIBRATION REFERENCE
1. Orion 210 ph meter	2210	See - Orion 210 ph meter Calibration logbook 14
2. YSI S-C-T meter	12911	See - YSI S-C-T meter Calibration logbook 13
3. YSI Dissolved Oxygen meter	2992	See - YSI D.O. meter Calibration logbook 15
4.		
5.		

FINAL WATER QUALITY INSTRUMENT READINGS

TEMP (°C) 27.2
CONDUCTIVITY (umhos/cm) 61 x 10
PH 7.80
EH 272
D.O. (mg/l) 7.04
OTHER

DUPLICATE WATER SAMPLING DATA INSTRUMENT READINGS

TEMP (°C)
CONDUCTIVITY (umhos/cm)
PH
EH
D.O. (mg/l)

TECHNICIAN CM TIME START 1640 TIME FINISH 1645

SAMPLE COLLECTION PERIOD: START 1640 STOP 1645 TECHNICIAN CM² DD

*NOTE: FOR LEVELS OF PROTECTION; SEE SITE SPECIFIC SAFETY PLAN FOR DETAILS.

SERIAL NO. WS _____
PAGE __ OF __

TOTAL VOLUME WATER COLLECTED 80 mL TOTAL NO. OF CONTAINERS 2
FIELD FILTERED: YES __ NO ✓ TIME _____ TECH. _____ FILTER TYPE _____
SAMPLES COOLED DURING COLLECTION PERIOD: YES ✓ NO __

SAMPLE CONTAINERS

QUANTITY	CONTAINER MATERIAL	SAMPLE LABEL SERIAL NO.	PRESERVATIVES	COMMENTS
40 mL	GLASS	SL000 51	ICE	VoA
40 mL	"	" 52	"	"

DOCUMENTATION

SAMPLE CONTAINERS SEALED: YES __ NO ✓ TIME _____ TECHNICIAN _____
SAMPLE SHIPPING CONTAINER SEALED & PACKED: YES ✓ NO __ TIME 2300 TECH. CM
LAB ANALYSIS REQUEST FORM: YES ✓ NO __ TIME 2300 SERIAL NO LAR2743 TECH. CM
CHAIN OF CUSTODY FORM: YES ~~NO~~ __ TIME 2300 SERIAL NO. 2743 / 2744 TECH. CM

COMMENTS: _____

SOIL
WATER SAMPLING DATA

SERIAL NO. WS 00018
PAGE __ OF __

PROJECT NAME Morrison ph 1 RI
SAMPLE LOCATION NO. OR BORING/WELL NO. ETHAN ALLEN POND 3902
PROJECT NO. 12872832
MAJOR TASK 2294 SUBTASK —
TECHNICAL CREW C. Maxeiner
DATE JUN 29 '87
FORM COMPLETED BY CM2/DD

WEATHER Sunny
LEVEL OF PROTECTION A B C (D) *
MEASURING POINT GS
METHOD OF MEASUREMENT SLOAT
MEASURING POINT ELEV. NG
INITIAL WATER LEVEL ELEV. NG

SOIL DEPTH 2.0'
SAMPLING METHOD Bottom Sed Sampler
INITIAL WATER LEVEL GS.
SPECIAL SAMPLING METHODS —
TIME ELAPSED/FINAL DEVELOPMENT/PURGING —
TECHNICIAN —
SAMPLING DEPTH INTERVAL —
PUMPING RATE/SAMPLING —

WATER QUALITY INSTRUMENTS USED	SERIAL NO.	CALIBRATION REFERENCE
1. N/A		
2.		
3.		
4.		
5.		

FINAL WATER QUALITY INSTRUMENT READINGS

TEMP (°C) N/A
CONDUCTIVITY (umhos/cm)
PH
EH
D.O. (mg/l)
OTHER
TECHNICIAN CM2 TIME START 1600 TIME FINISH

DUPLICATE WATER SAMPLING DATA INSTRUMENT READINGS

TEMP (°C)
CONDUCTIVITY (umhos/cm)
PH
EH
D.O. (mg/l)

SAMPLE COLLECTION PERIOD: START 1600 STOP 1610 TECHNICIAN CM2

*NOTE: FOR LEVELS OF PROTECTION; SEE SITE SPECIFIC SAFETY PLAN FOR DETAILS.

SERIAL NO. WS _____
PAGE __ OF __

TOTAL VOLUME ~~WATER~~ Soil COLLECTED 202 TOTAL NO. OF CONTAINERS 1
FIELD FILTERED: YES __ NO ✓ TIME ____ TECH. ____ FILTER TYPE ____
SAMPLES COOLED DURING COLLECTION PERIOD: YES ✓ NO __

SAMPLE CONTAINERS

QUANTITY	CONTAINER MATERIAL	SAMPLE LABEL SERIAL NO.	PRESERVATIVES	COMMENTS
207	GLASS	SL000053	ICE	VOA

DOCUMENTATION

SAMPLE CONTAINERS SEALED: YES __ NO ✓ TIME ____ TECHNICIAN ____
SAMPLE SHIPPING CONTAINER SEALED & PACKED: YES ✓ NO __ TIME 2300 TECH. CM
LAB ANALYSIS REQUEST FORM: YES ✓ NO __ TIME 2300 SERIAL NO. AR 2743 TECH. CM
CHAIN OF CUSTODY FORM: YES ✓ NO __ TIME 2300 SERIAL NO. 2743 2744 TECH. CM

COMMENTS: _____

SAMPLE CONTROL SHEET

SERIAL NO. SCS 00008
PAGE __ OF __

PROJECT NAME MORRISON PIT #1 DATE 6/29/87
PROJECT NO. 12872832 SAMPLER CMR
SAMPLE LOCATION NO. ETHAN ALLEN POND #202 CUSTODIAN CMR

SAMPLE NO.	SAMPLE LABEL NO.	C.O.C. NO.	SHIPPED	LAB ANALYSIS REQUEST NO.
H_2O	SL00051	2743	JUN 30 '87	CAR 2743
H_2O	52	↓	↓	↓
Soil	53			

WATER SAMPLING DATA

SERIAL NO. WS - 00074
PAGE __ OF __

PROJECT NAME Morrison ph 1 RI
SAMPLE LOCATION NO. OR BORING/WELL NO. S301
PROJECT NO. 12872832
MAJOR TASK 2294 DD
SUBTASK —
TECHNICAL CREW C Maxeiner / D Davenport
DATE JUN 30 '87
FORM COMPLETED BY CMZ

WEATHER SUNNY
LEVEL OF PROTECTION A B C (D)*
MEASURING POINT N. SURFACE
METHOD OF MEASUREMENT TAPE
MEASURING POINT ELEV. _____
INITIAL WATER LEVEL ELEV. _____

SAMPLING METHOD POINT SOURCE BAILER
INITIAL WATER ~~LEVEL~~ DEPTH 1.5'
SPECIAL SAMPLING METHODS _____
TIME ELAPSED/FINAL DEVELOPMENT/PURGING _____
TECHNICIAN CMZ
SAMPLING DEPTH INTERVAL 0-1.5'
PUMPING RATE/SAMPLING _____

WATER QUALITY INSTRUMENTS USED	SERIAL NO.	CALIBRATION REFERENCE	
1. Orion 210 ph Meter	2210	see Orion 210 ph Meter Calibration log	14
2. YSI S-C-T Meter	12911	see YSI S-C-T meter Calibration logbook	13
3. YSI Dissolved oxygen meter	2992	see YSI D.O. meter Calibration logbook	15
4.			
5.			

FINAL WATER QUALITY INSTRUMENT READINGS

TEMP (°C) 22.5
CONDUCTIVITY (umhos/cm) 58 x 10'
PH 8.11
EH 234
D.O. (mg/l) 7.99
OTHER _____

DUPLICATE WATER SAMPLING DATA INSTRUMENT READINGS

TEMP (°C) _____
CONDUCTIVITY (umhos/cm) _____
PH _____
EH _____
D.O. (mg/l) _____
_____

TECHNICIAN CMZ TIME START 1105 TIME FINISH 1110

SAMPLE COLLECTION PERIOD: START 1105 STOP 1110 TECHNICIAN CMZ

*NOTE: FOR LEVELS OF PROTECTION; SEE SITE SPECIFIC SAFETY PLAN FOR DETAILS.

SERIAL NO. WS _____
PAGE __ OF __

TOTAL VOLUME WATER COLLECTED 80mL TOTAL NO. OF CONTAINERS 2
FIELD FILTERED: YES __ NO ✓ TIME _____ TECH. _____ FILTER TYPE _____
SAMPLES COOLED DURING COLLECTION PERIOD: YES ✓ NO __

SAMPLE CONTAINERS

QUANTITY	CONTAINER MATERIAL	SAMPLE LABEL SERIAL NO.	PRESERVATIVES	COMMENTS
2-40mL	Glass	SL000 73,74	ICE	VOA

DOCUMENTATION

SAMPLE CONTAINERS SEALED: YES __ NO ✓ TIME _____ TECHNICIAN _____
SAMPLE SHIPPING CONTAINER SEALED & PACKED: YES ✓ NO __ TIME 0100 Jul 2 TECH. CM
LAB ANALYSIS REQUEST FORM: YES ✓ NO __ TIME 0100 Jul 2 SERIAL NO. 2231 TECH. CM
CHAIN OF CUSTODY FORM: YES ✓ NO __ TIME 0100 Jul 2 SERIAL NO. 2231 / 2734 TECH. CM

COMMENTS: _____

Soil ~~WATER~~ SAMPLING DATA

SERIAL NO. WS 00025
PAGE __ OF __

PROJECT NAME Morrison ph1 RI
SAMPLE LOCATION NO. OR BORING/WELL NO. S301
PROJECT NO. 12872832
MAJOR TASK ~~2293~~ 2294 DD SUBTASK —
TECHNICAL CREW C Maxeiner
DATE JUN 30 '87
FORM COMPLETED BY CM2/DD

WEATHER SUNNY
LEVEL OF PROTECTION A B C (D) *
MEASURING POINT W. SURFACE
METHOD OF MEASUREMENT TAPE
MEASURING POINT ELEV. _____
INITIAL WATER LEVEL ELEV. _____

SAMPLING METHOD BOTTOM SED Sampler
INITIAL WATER ~~LEVEL~~ DEPTH 1.5'
SPECIAL SAMPLING METHODS _____
TIME ELAPSED/FINAL DEVELOPMENT/PURGING _____
TECHNICIAN CM2
SAMPLING DEPTH INTERVAL 2-2.5'
PUMPING RATE/SAMPLING _____

WATER QUALITY INSTRUMENTS USED	SERIAL NO.	CALIBRATION REFERENCE
1.		
2.		
3.		
4.		
5.		

N/A

FINAL WATER QUALITY INSTRUMENT READINGS

TEMP (°C) _____
CONDUCTIVITY (umhos/cm) _____
PH _____
EH _____
D.O. (mg/l) _____
OTHER _____

DUPLICATE WATER SAMPLING DATA INSTRUMENT READINGS

TEMP (°C) _____
CONDUCTIVITY (umhos/cm) _____
PH _____
EH _____
D.O. (mg/l) _____

TECHNICIAN _____ TIME START _____ TIME FINISH _____

SAMPLE COLLECTION PERIOD: START 1100 STOP 1105 TECHNICIAN CM2

*NOTE: FOR LEVELS OF PROTECTION; SEE SITE SPECIFIC SAFETY PLAN FOR DETAILS.

SERIAL NO. WS _____
PAGE __ OF __

TOTAL VOLUME WATER COLLECTED 2oz TOTAL NO. OF CONTAINERS 1
FIELD FILTERED: YES __ NO ✓ TIME ____ TECH. ____ FILTER TYPE ____
SAMPLES COOLED DURING COLLECTION PERIOD: YES ✓ NO __

SAMPLE CONTAINERS

QUANTITY	CONTAINER MATERIAL	SAMPLE LABEL SERIAL NO.	PRESERVATIVES	COMMENTS
2oz	GLASS	SL00075	ICE	VOA

DOCUMENTATION

SAMPLE CONTAINERS SEALED: YES __ NO ✓ TIME ____ TECHNICIAN ____
SAMPLE SHIPPING CONTAINER SEALED & PACKED: YES ✓ NO __ TIME ~~Jul 2~~ Jul 2 0100 TECH. CM
LAB ANALYSIS REQUEST FORM: YES ✓ NO __ TIME Jul 2 0100 SERIAL NO. ~~2743~~ 2231 TECH. CM
CHAIN OF CUSTODY FORM: YES ✓ NO __ TIME Jul 2 0100 SERIAL NO. 2231/2734 TECH. CM

COMMENTS: DK GR Si SAND

SAMPLE CONTROL SHEET

SERIAL NO. SCS 00013
PAGE ___ OF ___

PROJECT NAME Morrison PH I RI
PROJECT NO. 12872832
SAMPLE LOCATION NO. S301

DATE Jun 30 '87
SAMPLER Cm
CUSTODIAN Cm

SAMPLE NO.	SAMPLE LABEL NO.	C.O.C. NO.	SHIPPED	LAB ANALYSIS REQUEST NO.
~~2+~~ VOA	SL00073; 74	~~2234~~ 2231 /2734	Jul 2 '87	LAB 2231
VOA	200075	⌊	⌊	✓

WATER SAMPLING DATA

SERIAL NO. WS 00026
PAGE __ OF __

PROJECT NAME Morrison ph 1 RI
SAMPLE LOCATION NO. OR BORING/WELL NO. S302
PROJECT NO. 12872832
MAJOR TASK 2294
SUBTASK —
TECHNICAL CREW C Maxeiner / D Davenport
DATE SUN 30 '87
FORM COMPLETED BY CM2/DD

WEATHER PTY cldy / SUNNY
LEVEL OF PROTECTION A B C (D) *
MEASURING POINT WSURFACE
METHOD OF MEASUREMENT TAPE
MEASURING POINT ELEV. _____
INITIAL WATER LEVEL ELEV. _____

SAMPLING METHOD Point Source Bailer
INITIAL WATER ~~LEVEL~~ DEPTH 0-1'
SPECIAL SAMPLING METHODS _____
TIME ELAPSED/FINAL DEVELOPMENT/PURGING _____
TECHNICIAN CM2
SAMPLING DEPTH INTERVAL 0-1'
PUMPING RATE/SAMPLING _____

WATER QUALITY INSTRUMENTS USED	SERIAL NO.	CALIBRATION REFERENCE	
1. Orion 210 ph meter	2210	see Orion 210 ph meter Calibration log book	14
2. YSI S-C-T meter	12911	see YSI S-C-T meter Calibration log book	13
3. YSI Dissolved Oxygen meter	2992	see YSI D.O. meter Calibration log book	15
4.			
5.			

FINAL WATER QUALITY INSTRUMENT READINGS

TEMP (°C) 22.1
CONDUCTIVITY (umhos/cm) 69x10'
PH 8.00
EH 254
D.O. (mg/l) 8.42
OTHER _____

DUPLICATE WATER SAMPLING DATA INSTRUMENT READINGS

TEMP (°C) 800 22.5
CONDUCTIVITY (umhos/cm) 69x10'
PH 8.03
EH 267
D.O. (mg/l) 8.53

TECHNICIAN CM2 TIME START 1230 TIME FINISH 1235

SAMPLE COLLECTION PERIOD: START 1230 STOP 1235 TECHNICIAN CM

*NOTE: FOR LEVELS OF PROTECTION; SEE SITE SPECIFIC SAFETY PLAN FOR DETAILS.

SERIAL NO. WS _____
PAGE __ OF __

TOTAL VOLUME WATER COLLECTED 80ML TOTAL NO. OF CONTAINERS 2
FIELD FILTERED: YES __ NO ✓ TIME _____ TECH. _____ FILTER TYPE _____
SAMPLES COOLED DURING COLLECTION PERIOD: YES ✓ NO __

SAMPLE CONTAINERS

QUANTITY	CONTAINER MATERIAL	SAMPLE LABEL SERIAL NO.	PRESERVATIVES	COMMENTS
2 x 40ML	GLASS	76 ; 77	—	VOA's

DOCUMENTATION

SAMPLE CONTAINERS SEALED: YES __ NO ✓ TIME _____ TECHNICIAN _____
SAMPLE SHIPPING CONTAINER SEALED & PACKED: YES ✓ NO __ TIME Jul 2 0100 TECH. CMZ
LAB ANALYSIS REQUEST FORM: YES ✓ NO __ TIME Jul 2 0100 SERIAL NO. 2231 TECH CMZ
CHAIN OF CUSTODY FORM: YES ✓ NO __ TIME Jul 2 0100 SERIAL NO. 2231 / 2734 TECH CMZ

COMMENTS: _____

SOIL ~~WATER~~ SAMPLING DATA

SERIAL NO. WS 00027
PAGE __ OF __

PROJECT NAME Morrison ph 1 R.I
SAMPLE LOCATION NO. OR BORING/WELL NO. S302
PROJECT NO. 12872832 MAJOR TASK 2294 SUBTASK —
TECHNICAL CREW C Maxeiner / DDavenport
DATE JUN 30 '87 FORM COMPLETED BY CM² / DD

WEATHER PTL: Cldy/Sunny LEVEL OF PROTECTION A B C (D) *
MEASURING POINT H2O SURFACE METHOD OF MEASUREMENT TAPE
MEASURING POINT ELEV. _____ INITIAL WATER LEVEL ELEV. _____

SAMPLING METHOD Bottom Sed Sampler INITIAL WATER ~~LEVEL~~ DEPTH ~1.0'
SPECIAL SAMPLING METHODS _____
TIME ELAPSED/FINAL DEVELOPMENT/PURGING _____ TECHNICIAN CM
SAMPLING DEPTH INTERVAL 1'-2' PUMPING RATE/SAMPLING —

WATER QUALITY INSTRUMENTS USED	SERIAL NO.	CALIBRATION REFERENCE
1. N/A		
2.		
3.		
4.		
5.		

FINAL WATER QUALITY INSTRUMENT READINGS

TEMP (°C) N/A
CONDUCTIVITY (umhos/cm) _____
PH _____
EH _____
D.O. (mg/l) _____
OTHER _____

DUPLICATE WATER SAMPLING DATA INSTRUMENT READINGS

TEMP (°C) _____
CONDUCTIVITY (umhos/cm) _____
PH _____
EH _____
D.O. (mg/l) _____

TECHNICIAN _____ TIME START _____ TIME FINISH _____

SAMPLE COLLECTION PERIOD: START 1210 STOP 1230 TECHNICIAN CM²

*NOTE: FOR LEVELS OF PROTECTION; SEE SITE SPECIFIC SAFETY PLAN FOR DETAILS.

SERIAL NO. WS _____
PAGE __ OF __

TOTAL VOLUME WATER COLLECTED 2 OZ TOTAL NO. OF CONTAINERS 1
FIELD FILTERED: YES __ NO ✓ TIME _____ TECH. _____ FILTER TYPE _____
SAMPLES COOLED DURING COLLECTION PERIOD: YES ✓ NO __

SAMPLE CONTAINERS

QUANTITY	CONTAINER MATERIAL	SAMPLE LABEL SERIAL NO.	PRESERVATIVES	COMMENTS
2 OZ	GLASS	78	—	VOA

DOCUMENTATION

SAMPLE CONTAINERS SEALED: YES __ NO ✓ TIME _____ TECHNICIAN _____
SAMPLE SHIPPING CONTAINER SEALED & PACKED: YES ✓ NO __ TIME Jul 2 0100 TECH. CM
LAB ANALYSIS REQUEST FORM: YES ✓ NO __ TIME Jul 2 0100 SERIAL NO. 2231 TECH. CM
CHAIN OF CUSTODY FORM: YES ✓ NO __ TIME Jul 2 0100 SERIAL NO. 2231 2234 TECH. CM

COMMENTS: DK BR SA GRAVEL w/ si, ORG

SAMPLE CONTROL SHEET

SERIAL NO. SCS 00014
PAGE ___ OF ___

PROJECT NAME Morrison ph 1 R.I
PROJECT NO. 12872832
SAMPLE LOCATION NO. S302

DATE Jun 30 '87
SAMPLER CW2
CUSTODIAN CW

SAMPLE NO.	SAMPLE LABEL NO.	C.O.C. NO.	SHIPPED	LAB ANALYSIS REQUEST NO.
VOA	76 & 77	2231 /2234	Jul 2 '87	2231
VOA Soil	78	✓	✓	✓

WATER SAMPLING DATA

SERIAL NO. WS 00028
PAGE __ OF __

PROJECT NAME Morrison ph 1 RI
SAMPLE LOCATION NO. OR BORING/WELL NO. S302 Dup
PROJECT NO. 12872032
MAJOR TASK 2294
SUBTASK ____
TECHNICAL CREW C Maxeiner / D Davenport
DATE JUN 30 '87
FORM COMPLETED BY CM2/00

WEATHER Ptly Cldy / Sunny
LEVEL OF PROTECTION A B C D *
MEASURING POINT H2O SURFACE
METHOD OF MEASUREMENT TAPE
MEASURING POINT ELEV. ____
INITIAL WATER LEVEL ELEV. ____

SAMPLING METHOD ~~POINT SOURCE BAILER~~
INITIAL WATER ~~LEVEL~~ DEPTH 0-1'
SPECIAL SAMPLING METHODS ____
TIME ELAPSED/FINAL DEVELOPMENT/PURGING ____
TECHNICIAN CMX
SAMPLING DEPTH INTERVAL 0-1
PUMPING RATE/SAMPLING ____

WATER QUALITY INSTRUMENTS USED	SERIAL NO.	CALIBRATION REFERENCE
1. Orion 210 ph meter	2210	see Orion 210 ph meter Calibration logbook 14
2. YSI S-C-T meter	12911	see YSI S-C-T meter Calibration logbook 13
3. YSI Dissolved Oxygen meter	2992	see DO meter Calibration logbook 15
4.		
5.		

FINAL WATER QUALITY INSTRUMENT READINGS

TEMP (°C) ~~8.03~~ DD 22.5
CONDUCTIVITY (umhos/cm) 69X10'
PH 8.03
EH 267
D.O. (mg/l) 8.53
OTHER ____

DUPLICATE WATER SAMPLING DATA INSTRUMENT READINGS

TEMP (°C) ____
CONDUCTIVITY (umhos/cm) ____
PH ____
EH ____
D.O. (mg/l) ____

TECHNICIAN CMX TIME START 1230 TIME FINISH 1235

SAMPLE COLLECTION PERIOD: START 1230 STOP 1235 TECHNICIAN CMX

*NOTE: FOR LEVELS OF PROTECTION; SEE SITE SPECIFIC SAFETY PLAN FOR DETAILS.

SERIAL NO. WS -
PAGE __ OF __

TOTAL VOLUME WATER COLLECTED 80 ml TOTAL NO. OF CONTAINERS 2
FIELD FILTERED: YES __ NO ✓ TIME ____ TECH. ____ FILTER TYPE ____
SAMPLES COOLED DURING COLLECTION PERIOD: YES ✓ NO __

SAMPLE CONTAINERS

QUANTITY	CONTAINER MATERIAL	SAMPLE LABEL SERIAL NO.	PRESERVATIVES	COMMENTS
2 x 40ml	G|AG	79280	—	VOA

DOCUMENTATION

SAMPLE CONTAINERS SEALED: YES __ NO ✓ TIME ____ TECHNICIAN ____
SAMPLE SHIPPING CONTAINER SEALED & PACKED: YES ✓ NO __ TIME 0100 Jul 12 TECH. CAR
LAB ANALYSIS REQUEST FORM: YES ✓ NO __ TIME 0900 Jul 12 SERIAL NO. 2231 TECH. CAR
CHAIN OF CUSTODY FORM: YES ✓ NO __ TIME 0100 Jul 12 SERIAL NO. 2231 / 2234 TECH. CAR

COMMENTS: ____

SOIL ~~WATER~~ SAMPLING DATA

SERIAL NO. WS 00029
PAGE __ OF __

PROJECT NAME Morrison ph 1 RI. SAMPLE LOCATION NO. OR BORING/WELL NO. S302 Dup
PROJECT NO. 12877832 MAJOR TASK 2294 SUBTASK —
TECHNICAL CREW C Maxeiner / D Davenport
DATE JUN 30 '87 FORM COMPLETED BY

WEATHER Ptly cldy/Sunny LEVEL OF PROTECTION A B C (D)*
MEASURING POINT H2O SURFACE METHOD OF MEASUREMENT TAPE
MEASURING POINT ELEV. ____ INITIAL WATER LEVEL ELEV. ____

SAMPLING METHOD Bottom Sed Sampler INITIAL WATER ~~LEVEL~~ DEPTH 1.0'
SPECIAL SAMPLING METHODS ____
TIME ELAPSED/FINAL DEVELOPMENT/PURGING ____ TECHNICIAN CMR
SAMPLING DEPTH INTERVAL 1-2' PUMPING RATE/SAMPLING —

WATER QUALITY INSTRUMENTS USED	SERIAL NO.	CALIBRATION REFERENCE
1. N/A		
2.		
3.		
4.		
5.		

FINAL WATER QUALITY INSTRUMENT READINGS

TEMP (°C) ____
CONDUCTIVITY (umhos/cm) ____
PH N/A
EH ____
D.O. (mg/l) ____
OTHER ____

DUPLICATE WATER SAMPLING DATA INSTRUMENT READINGS

TEMP (°C) ____
CONDUCTIVITY (umhos/cm) ____
PH ____
EH ____
D.O. (mg/l) ____

TECHNICIAN ____ TIME START ____ TIME FINISH ____

SAMPLE COLLECTION PERIOD: START 1230 STOP 1230 TECHNICIAN CMR

*NOTE: FOR LEVELS OF PROTECTION; SEE SITE SPECIFIC SAFETY PLAN FOR DETAILS.

SERIAL NO. WS _____
PAGE __ OF __

TOTAL VOLUME WATER COLLECTED 202 TOTAL NO. OF CONTAINERS 1
FIELD FILTERED: YES __ NO ✓ TIME _____ TECH. _____ FILTER TYPE _____
SAMPLES COOLED DURING COLLECTION PERIOD: YES ~~NO~~ NO __

SAMPLE CONTAINERS

QUANTITY	CONTAINER MATERIAL	SAMPLE LABEL SERIAL NO.	PRESERVATIVES	COMMENTS
207	GLASS	81	—	VOA

DOCUMENTATION

SAMPLE CONTAINERS SEALED: YES __ NO ✓ TIME _____ TECHNICIAN _____
SAMPLE SHIPPING CONTAINER SEALED & PACKED: YES ✓ NO __ TIME July 2 0801 TECH. CW2
LAB ANALYSIS REQUEST FORM: YES ✓ NO __ TIME July 2 0800 SERIAL NO. 2231 TECH. CW2
CHAIN OF CUSTODY FORM: YES ✓ NO __ TIME July 2 0800 SERIAL NO. 2231 / 2754 TECH. CW2

COMMENTS: OK GR SA Grnwl w/ Si, ORG

SAMPLE CONTROL SHEET

SERIAL NO. SCS 00015
PAGE ___ OF ___

PROJECT NAME Morrison ph 1 R.I.
PROJECT NO. 12872832
SAMPLE LOCATION NO. S302 Dup

DATE JUN 30 '87
SAMPLER Own
CUSTODIAN Caz

SAMPLE NO.	SAMPLE LABEL NO.	C.O.C. NO.	SHIPPED	LAB ANALYSIS REQUEST NO.
VoA	79 & 80	2231/2734	July 2 '87	2231
VoA Soil	81	2231/2734	↓	

Notification of Hazardous Waste Site — Side Two

F Waste Quantity

Place an X in the appropriate boxes to indicate the facility types found at the site.

In the "total facility waste amount" space give the estimated combined quantity (volume) of hazardous wastes at the site using cubic feet or gallons.

In the "total facility area" space give the estimated area size which the facilities occupy using square feet or acres.

Facility Type

1. ☐ Piles
2. ☐ Land Treatment
3. ☐ Landfill
4. ☐ Tanks
5. ☐ Impoundment
6. ☐ Underground Injection
7. ☐ Drums, Above Ground
8. ☐ Drums, Below Ground
9. ☒ Other (Specify) Solvent dumped out of barrels onto ground.

Total Facility Waste Amount

cubic feet

gallons 6600 (estimate) G

Total Facility Area

square feet

acres Unknown

G Known, Suspected or Likely Releases to the Environment:

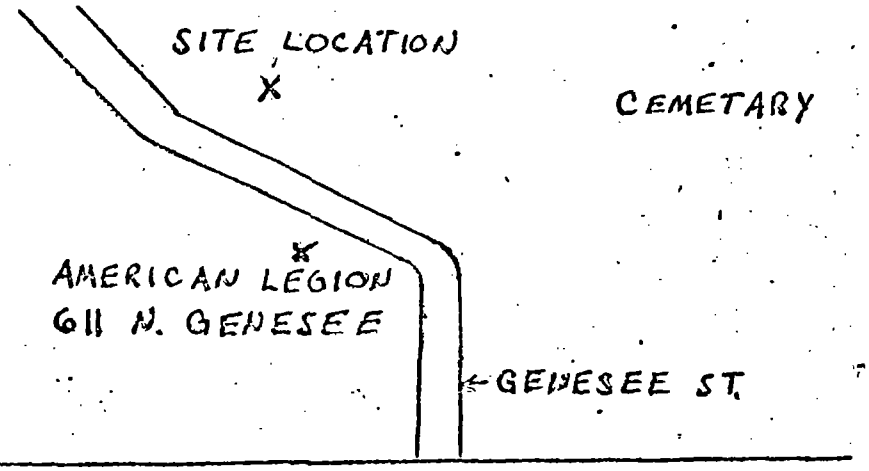
Place an X in the appropriate boxes to indicate any known, suspected, or likely releases of wastes to the environment.

☐ Known ☐ Suspected ☐ Likely ☒ None

Note: Items H and I are optional. Completing these items will assist EPA and State and local governments in locating and assessing hazardous waste sites. Although completing the items is not required, you are encouraged to do so.

H Sketch Map of Site Location: (Optional)

Sketch a map showing streets, highways, routes or other prominent landmarks near the site. Place an X on the map to indicate the site location. Draw an arrow showing the direction north. You may substitute a publishing map showing the site location.



I Description of Site: (Optional)

Describe the history and present conditions of the site. Give directions to the site and describe any nearby wells, springs, lakes, or housing. Include such information as how waste was disposed and where the waste came from. Provide any other information or comments which may help describe the site conditions.

J Signature and Title:

The person or authorized representative (such as plant managers, superintendents, trustees or attorneys) of persons required to notify must sign the form and provide a mailing address (if different than address in item A). For other persons providing notification, the signature is optional. Check the boxes which best describe the relationship to the site of the person required to notify. If you are not required to notify check "Other."

Name K.M. Fox, Manager, Manufacturing

Street 709 W. Wall St.

City Morrison State IL Zip Code 61270

Signature K M Fox Date 6/15/

☐ Owner, Present
☐ Owner, Past
☒ Transporter
☐ Operator, Present
☐ Operator, Past
☐ Other

[FR Doc. 81-11500 Filed 4-14-81, 8:45 am]

BILLING CODE 6560-29-C

EPA Notification of Hazardous Waste Site

United States
Environmental Protection
Agency
Washington DC 20460

This initial notification information is required by Section 103(c) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 and must be mailed by June 9, 1981.

Please type or print in ink. If you need additional space, use separate sheets of paper. Indicate the letter of the item which applies.

810608 IL #145 US EPA ID #ILD005272992 ILS-000-001-063

A Person Required to Notify:
Enter the name and address of the person or organization required to notify.

Name: General Electric Co.
Street: 709 W. Wall St.
City: Morrison State: IL Zip Code: 61270

B Site Location:
Enter the common name (if known) and actual location of the site.

ILD980606727 (Inactive)

Name of Site: City dump
Street: Genesee
City: Morrison County: Whiteside State: IL Zip Code: 61270

C Person to Contact:
Enter the name, title (if applicable), and business telephone number of the person to contact regarding information submitted on this form.

Name (Last, First and Title): Skaff, Joseph Environmental & Safety Eng.
Phone: 1-(815)-772-2131

D Dates of Waste Handling:
Enter the years that you estimate waste treatment, storage, or disposal began and ended at the site.

From (Year): 1949 To (Year): 1959 (estimate)

E Waste Type: Choose the option you prefer to complete

Option 1: Select general waste types and source categories. If you do not know the general waste types or sources, you are encouraged to describe the site in Item I—Description of Site.

General Type of Waste:
Place an X in the appropriate boxes. The categories listed overlap. Check each applicable category.

1. ☐ Organics
2. ☐ Inorganics
3. ☒ Solvents
4. ☐ Pesticides
5. ☐ Heavy metals
6. ☐ Acids
7. ☐ Bases
8. ☐ PCBs
9. ☐ Mixed Municipal Waste
10. ☐ Unknown
11. ☐ Other (Specify)

Source of Waste:
Place an X in the appropriate boxes.

1. ☐ Mining
2. ☐ Construction
3. ☐ Textiles
4. ☐ Fertilizer
5. ☐ Paper/Printing
6. ☐ Leather Tanning
7. ☐ Iron/Steel Foundry
8. ☐ Chemical, General
9. ☐ Plating/Polishing
10. ☐ Military/Ammunition
11. ☐ Electrical Conductors
12. ☐ Transformers
13. ☐ Utility Companies
14. ☐ Sanitary Refuse
15. ☐ Photofinish
16. ☐ Lab/Hospital
17. ☐ Unknown
18. ☒ Other (Specify) Manufacturing appliance controls

Option 2: This option is available to persons familiar with the Resource Conservation and Recovery Act (RCRA) Section 3001 regulations (40 CFR Part 261).

Specific Type of Waste:
EPA has assigned a four-digit number to each hazardous waste listed in the regulations under Section 3001 of RCRA. Enter the appropriate four-digit number in the boxes provided. A copy of the list of hazardous wastes and codes can be obtained by contacting the EPA Region serving the State in which the site is located.

F001

000089 JUN-8 81

Form Approved
OMB No. 2060-0138

JUN 10 1981